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ALL VOLUMES

R645-301-100 Through R645-301-800

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Chapter 5

R645-301-500

Engineering

CHAPTER 5

R645-301-500. ENGINEERING

510. INTRODUCTION.

The engineering section of the Mining and Reclamation Plan (MRP) is divided into the operation plan, reclamation plan, design criteria, and performance standards. All of the activities associated with the coal mining and reclamation operations are designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plan.

511. GENERAL REQUIREMENTS

511.100 - 511.300. Contents

The operation and reclamation permit application includes descriptions of the coal mining and reclamation operations with attendant Drawings, plans, and cross sections. and its potential impacts to the environment as well as methods and calculations utilized to achieve compliance with design criteria.

512. CERTIFICATIONS

512.100. Cross Sections and Drawings.

All cross sections and Drawings required under applicable portions of sections 512.100 through 512.150 will be prepared by, or under the direction of, and certified by: a qualified, registered, professional engineer; a professional geologist; or a qualified, registered, professional land surveyor, with assistance from experts in related fields such as hydrology, geology and landscape architecture. Cross sections and Drawings will be updated as required.

512.200. Plans and Engineering Designs.

All plans for excess spoil, durable rock fills, coal mine waste, impoundments, primary roads and variances from approximate original contour will be certified by a qualified registered professional engineer.

512.210 - 230 Excess Spoil Disposal Areas, Durable Rock Fills and Coal Mine Waste Structures

The MRP does not contemplate the construction of any permanent Excess Spoil disposal areas, Durable Rock Fills or Coal Mine Waste structures. If such structures become part of the plan, a professional engineer experienced in the design of earth and rock fills and or disposal facilities will certify the design according to 535.100 - 536.

512.240. Impoundments.

A professional engineer experienced in the design and construction of impoundments will use current, prudent, engineering practices and will certify the design of the impoundment according to 743.

512.250. Primary Roads.

A professional engineer will certify the design and construction or reconstruction of primary roads as meeting the requirements of 742.420.

512.260. Variance From Approximate Original Contour.

The MRP is designed to return the mined area to its approximate original contour. If a variance from the approximate original contour is required, a professional engineer will certify the design for the proposed variance from the approximate original contour, as described under 270, in conformance with professional standards established to assure the stability, drainage and configuration necessary for the intended use of the site.

513. COMPLIANCE WITH MSHA REGULATIONS AND MSHA APPROVALS.

513.100. Coal Processing Waste Dams and Embankments

Not applicable

513.200. Impoundments and Sedimentation Ponds

No impoundments or sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) exist or are planned within the proposed Mine Permit Area. Should impoundments and sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) become necessary, compliance with the requirements of MSHA, 30 CFR 77.216 will be met.

513.300. Disposal of Underground Development Waste, Coal Processing Waste and Excess Spoil in underground mine workings.

Not applicable

513.400. Refuse Piles

Not Applicable

513.500. Capping, Sealing and Backfilling Openings to the Surface from the Underground.

Not Applicable

513.600. Discharges into an underground mine

Not Applicable

513.700. Surface Mining Closer than 500 Feet to an Active Underground Mine

Not Applicable

513.800. Coal Mine Waste Fires

Not Applicable

514. INSPECTIONS

All engineering inspections, will be conducted by a qualified registered professional engineer or other qualified professional specialist under the direction of the professional engineer.

514.100 – 140 Excess Spoil.

The MRP does not contemplate the construction of any permanent excess spoil disposal areas. If such disposal areas become necessary, a professional engineer or specialist experienced in the construction of earth and rock fills will conduct inspections, provide reports certified by a registered professional engineer, and otherwise meet the requirements of R645-301-514.100 through R645-301-514.140.:

514.200 - 250. Refuse Piles.

Not Applicable

514.300. Impoundments.

514.310 - 313. Certified Inspection.

A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments. Inspections will be made regularly during construction, upon completion of construction, and at least yearly until removal of the structure or release of the performance bond. The qualified registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. A copy of the report will be retained at or near the mine site.

514.320. Inspection Standard and Frequency

The MRP does not contemplate construction of any impoundments meeting the NRCS Class B or C criteria for dams in TR-60, or the size or other criteria of 30 CFR Sec. 77.216. If such impoundments become necessary, they will be examined in accordance with 30 CFR Sec. 77.216-3. Impoundments not meeting the NRCS Class B or C Criteria for dams in TR-60, or subject to 30 CFR Sec. 77.216, will be examined at least quarterly. A qualified person designated by Alton Coal Development LLC will examine impoundments for the appearance of structural weakness and other hazardous conditions.

515. REPORTING AND EMERGENCY PROCEDURES

515.100. Slides

Any time a slide occurs which may have a potential adverse effect on public, property, health, safety, or the environment, Alton Coal Development LLC will notify the Division by the fastest available means and comply with any remedial measures required by the Division.

515.200. Impoundment Hazards.

If any examination or inspection of an impoundment discloses that a potential hazard exists, the person who examined the impoundment will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action. If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

515.300. Temporary Cessation

515.312.

During a temporary cessation, surface facilities in areas in which there are no current operations, but in which operations are to be resumed under an approved permit will be effectively secured.

515.320.

Before temporary cessation of coal mining and reclamation operations for a period of 30 days or more, or as soon as it is known that a temporary cessation will extend beyond 30 days, a notice of intention to cease or abandon operations will be submitted to the division. This notice will include:

- A statement of the exact number of acres which have been affected in the permit area prior to such temporary cessation,
- The extent and kind of reclamation of those areas which has been accomplished, and

521.122. Surface and Subsurface Man-Made Features

Not Applicable

521.123. Public Roads

One public road, Kane County Road 136 is located in or within 100 feet of the proposed permit area and is shown on Drawing 5-1 (site specific road drawing to be added).

521.124. Existing areas of spoil, waste, coal development waste, and noncoal waste disposal, dams, embankments, other impoundments, and water treatment and air pollution control facilities.

Not Applicable

521.125. Ponds and Other Impoundments

The MRP does not contemplate construction of any permanent water impoundments; coal processing waste banks and coal processing waste dams or embankments. The planned location of each sedimentation pond is shown on Drawing TBA Site specific Drawings will be updated

521.130. Landowners and Right of Entry and Public Interest Drawings.

All boundaries of lands and the names of present owners of record of both surface and subsurface within the Mine Permit Area are shown on Drawing 1-3 (Surface) and Drawing 1-4 (Subsurface).

521.132. Permit Boundary

The boundaries of land within the proposed permit area are shown on all applicable Drawings.

521.133. Public Roads

No mining or reclamation operations are planned within 100 ft. of a public road. However mine vehicles may cross the right-of-way of Kane County Road #136 for a short period early in the operation's life. Appropriate measures, including signage and mine operating practices and training will be implemented to protect the public.

521.122. Surface and Subsurface Man-Made Features

Not Applicable

521.123. Public Roads

One public road, Kane County Road 136 is located in or within 100 feet of the proposed permit area and is shown on Drawing 5-1 (site specific road drawing to be added).

521.124. Existing areas of spoil, waste, coal development waste, and noncoal waste disposal, dams, embankments, other impoundments, and water treatment and air pollution control facilities.

Not Applicable

521.125. Ponds and Other Impoundments

The MRP does not contemplate construction of any permanent water impoundments; coal processing waste banks and coal processing waste dams or embankments. The planned location of each sedimentation pond is shown on Drawing TBA Site specific Drawings will be updated

521.130. Landowners and Right of Entry and Public Interest Drawings.

All boundaries of lands and the names of present owners of record of both surface and subsurface within the Mine Permit Area are shown on Drawing 1-2 (Surface) and Drawing 1-3 (Subsurface).

521.132. Permit Boundary

The boundaries of land within the proposed permit area are shown on all applicable Drawings.

521.133. Public Roads

No mining or reclamation operations are planned within 100 ft. of a public road. However mine vehicles may cross the right-of-way of Kane County Road #136 for a short period early in the operation's life. Appropriate measures, including signage and mine operating practices and training will be implemented to protect the public.

521.133.2 Relocating a Public Road:

The design of any relocated road will be approved by Kane County authorities, or such other authorities as have jurisdiction. Appropriate measures will be taken to prevent entrance into the mining area via the pre-existing road, and appropriate signage and barriers will be installed to protect the public.

521.140. Mine Drawings and Permit Area Drawings.

521.141- 143.

The boundaries of all areas proposed to be affected over the estimated total life of the coal mining and reclamation operations, with a description of size, sequence and timing of the mining, the coal mining and reclamation operations to be conducted, the lands to be affected throughout the operation, and changes in facilities or features to be caused by the proposed operations are depicted on Drawing 5-2. Site-specific Drawings will be updated

No permanent spoil disposal structures are contemplated in the MRP. Proposed locations of temporary spoil disposal structures are shown on Drawing 5-1. Site-specific Drawings will be updated

521.150. Land Surface Configuration Drawings.

Surface contours representing the existing land surface configuration of the proposed permit area are shown on Drawing TBA. Site-specific Drawings will be updated

521.160. Drawings and Cross Sections of the Proposed Features for the Proposed Permit Area.

Proposed features for the Proposed Permit Area are shown on Drawing 5-1 and Drawing TBA. Site-specific Drawings will be updated

Features include:

- Buildings, utility corridors, and facilities to be used;
- The area of land to be affected within the proposed permit area, according to the sequence of mining and reclamation;
- Each area of land for which a performance bond or other equivalent guarantee will be posted.
- Coal storage, cleaning and loading area.
- Each topsoil, and spoil storage area.
- Each explosive storage and handling facility.
- Each air pollution collection and control facility

521.170. Transportation Facilities Drawings.

The Coal Hollow Mine plan does not incorporate any transportation facilities other than roads within the mine area. The locations of those roads and the coal loading facilities are shown on Drawing 5-1. Site-specific Drawings will be updated

521.180. Support facilities.

Planned mine support facilities include office, shop, fuel storage, explosives storage and coal handling facilities are shown on Drawing 5-1. Site-specific Drawings will be updated

During mine development and the initial mining period, some facilities of a temporary nature such as mobile buildings and crusher/stacking conveyors may be utilized.

521.200. Signs and Markers Specifications.

Signs and markers will be posted, maintained, and removed by Alton Coal Development LLC. Signs and markers will be a uniform design that can be easily seen and read; made of durable material; conform to local laws and regulations, and be maintained during all activities to which they pertain;

521.240. Mine and Permit Identification Signs.

Identification signs showing the name, business address, and telephone number of Alton Coal Development LLC and the identification number of the permanent program permit authorizing coal mining and reclamation operations will be displayed at each point of access to the permit area from public roads, and will be retained and maintained until after the release of all bonds for the permit area;

521.250. Perimeter Markers.

The perimeter of a permit area will be clearly marked before the beginning of surface mining activities;

521.260. Buffer Zone Markers.

Buffer zones will be marked along their boundaries as required under 731.600

521.270. Topsoil Markers.

Markers will be erected to mark where topsoil or other vegetation - supporting material is physically segregated and stockpiled.

522. COAL RECOVERY.

The MRP is designed to maximize the recovery of the coal resource. Coal will be recovered from the Smirl seam, which ranges in thickness from 13.5 to 18.5 feet averaging approximately 16 feet in the planned mining area. The Smirl seam is the only surface mineable seam in the area, and the full seam section is planned for recovery. The application of highly flexible, open pit truck/shovel techniques will allow minimize losses of coal due to pit geometry or spoil support requirements. In order to maximize the use and conservation of the coal resource, coal will be recovered using large hydraulic backhoes or front end loaders. The backhoes provide the ability to efficiently excavate the lower part of the coal seam and thus minimize floor losses. Front end loaders provide similar control of digging horizons, and can recover coal from confined areas in the pit. using open pit type surface mining methods. No washing of the coal is contemplated at this time, thus there will be no coal processing losses.

Normal coal losses are expected due to cleaning of the top of the seam, loading losses at the seam floor, and coal oxidation near the outcrop. The recoverable tonnage is also limited by property restrictions including a 100 ft. undisturbed zone adjacent to any property where surface rights are not controlled, and losses of coal in the pit slopes. Current plans are for a planned maximum mining depth of approximately 220 ft., however, the ultimate mining depth will depend on cost related factors. The planned mining sequence and recovery area at the Coal Hollow Mine is shown on Drawing 5-2. Drawings will be updated

523. MINING METHOD(s).

The Coal Hollow Mine will be a surface coal mining operation using open pit mining methods to produce approximately 2 million tons of coal per year. Primary mining equipment will include hydraulic backhoes and end-dump mining trucks. The coal will be crushed at the mine site, and hauled to market in over-the-road coal trucks.

The mine is planned to produce approximately 5.9 million tons of coal over a life of approximately 3 years. The production schedule is summarized:

Year	Tons Produced (000)
1	1,975
2	2,000
3	1,915
Total	5,890

Initial mine development will involve removal and storage of topsoil from mine infrastructure locations. Facilities for equipment maintenance, coal handling, offices and warehouse will be constructed. During the development and initial mining period facilities temporary in nature may be used until permanent facilities can be built.

Construction of sedimentation ponds, diversion ditches, and mine roads accessing the initial mining areas will also be ongoing.

Mining will employ typical open pit methods using truck/loader type equipment to remove overburden and recover the coal. Mining will advance across the property in successive cuts approximately 150 ft. in width and 1,000 to 1,200 ft. long (generally equal to the width of the property less property barriers.) The overburden will be removed in layers or lifts approximately 20 ft. deep. In practice these overburden lifts are mined in a stairstep fashion ahead of the coal removal operation to provide adequate working room for the equipment and stable advancing slopes. Typical cross-sections for mining under shallow and mining under deep cover are found in Drawing 5-3 and 5-4 Drawings will be updated. Once mining is complete, excavated overburden (spoil) from a successive cut is used to backfill the excavation to its approximate original contour.

Prior to beginning mining, the area will be cleared of vegetation, and the topsoil will be recovered and either stockpiled or direct placed on regraded areas. Each lift will be drilled and blasted as necessary to break the rock and facilitate excavation. After blasting, overburden will be removed using large backhoes or front end loaders and off-road trucks which will haul the spoil and place it in parts of the pit where the coal has been removed, or in temporary out-of-pit storage areas. Overburden is removed in successively deeper benches until the coal seam is exposed. Some overburden in lower lifts may be moved by direct dozing into the mined out pit by large bulldozers.

When overburden removal is finished in a particular pit, the top of the coal will be cleaned (removal of any roof rock or other non-coal material on top of the seam) using a motor grader, dozer or front end loader. The material removed will be placed in the adjacent mined out pit. If necessary, the coal seam will be loosened by drilling and blasting or ripping prior to loading. The cleaned, exposed coal is then excavated by backhoe or front end loader and placed into off-road rear dump trucks.

Once the coal is removed, the pit will be backfilled by spoil from adjacent mine pits (direct placement) or spoil recovered from the temporary spoil pile. Spoil will be placed in lifts and spread with a dozer. Once the pit is backfilled to it's planned final surface contour, topsoil will be replaced, and the area reseeded. Revegetation work will proceed seasonally as appropriate for planting.

Overburden excavation and coal mining at Coal Hollow will begin near the subcrop of the coal seam at the western end of the permit area in the NW ¼ NE ¼ of Section 30, T39S, R5W. Topsoil will be removed and stored separately in topsoil stockpiles as shown on Drawing 5-1 Drawings will be updated. Overburden from the initial pits will be hauled to the temporary spoil stockpile east of the mining area where it will be used to backfill the final mine pit. Once the initial pit is established, as much spoil as possible will be placed directly in the pit backfill, allowing reclamation to closely follow mining.

From the initial mining area, operations will proceed eastward through the NE ¼ of Section 30, See Drawing 5-2. Site-specific Drawings will be updated

to County Road 136. The pit will then turn north, and advance across the SW ¼ of the SE ¼ of Section 19 T39S, R5W. That area will be mined out early in the second year of mining. The pit will then turn south, and progress through the eastern ¼ of Section 30. That area will be depleted late in the second year of mining. As mining progresses to the south in Section 30, prestripping of the high cover area in the NE ¼ of NE ¼ of Section 30, and the NW ¼ of NW ¼ of Section 29 will begin. Mining will conclude with removal of the coal from this area late in the 3rd year of mining.

The primary mining equipment planned for use at the Coal Hollow Mine is listed below:

Diesel Overburden Drill (7-5/8 to 10-5/8 in. hole diameter)
Diesel - Hydraulic Backhoes (15 to 19 cu. yd. capacity).
Rubber Tired Front End Loaders (8 to 20 cu. yd. capacity)
End Dump Trucks (100 ton capacity class)
Track Dozers (Caterpillar D9 through D10 Class)
Motor Graders (Caterpillar 16H Class)
Water Trucks (20,000 Gallon Class)

A variety of other equipment will also be used to support the mining operation.

There are no known underground mines within 500 feet of the permit area; therefore, no surface mining or reclamation activities will take place within 500 feet of any underground mine.

524. BLASTING AND EXPLOSIVES

As a result of the 2005 drilling program and overburden characterization, it was determined that the soil over the coal seam was void of any solid structure and that the overburden was extremely homogenous consisting of soft clay and soft shale. As results of this cursory investigation, it is anticipated that there would be no need to drill and blast the overburden to facilitate the removal of the spoil above the coal seam. Also, due to the fact that the coal will have to be mined from on top of the seam due to wet clay zone beneath the coal seam it is anticipated that there would be no need to drill and blast the coal seam to facilitate coal removal. To better quantify these scenarios, a research mining and reclamation pit will be constructed. Under a minor exploration permit, <250 tons of coal will be excavated from the excavated pit. The excavation of the research pit and evacuation of 250 tons of coal will glean quantitative data on mining and equipment scenarios. In addition to the information gleaned for mining applications, the research pit will afford real-time data for reclamation and approximate original contouring.

As a safeguard or fallback position if mining condition should change, all blasting and explosive criteria will be addressed.

Explosives will be utilized as necessary at Coal Hollow Mine to break the overburden over the coal and may be used to break the coal for loading if necessary. In accordance with the requirements of this section, a blasting plan will be provided to MSHA and the division. Each blasting plan will contain a description of any system to be used to monitor compliance with the standards of 524.600 including the type, capability, and sensitivity of any blast-monitoring equipment and the proposed procedures. Blast that use more than five pounds of explosives or blasting agents will be conducted according to the schedule provided in 524.400.

524.100 Blaster Certification

Alton Coal Development LLC will, prior to conducting any surface blasting operations, ensure that all surface blasting incident to surface mining in Utah is conducted under the direction of a Utah Certified Blaster. Certificates of blaster certification will be carried by the blasters or will be on file at the mine permit area during blasting operations. A blaster and at least one other person will be present at the firing of a blast.

Persons responsible for blasting operations at a blasting site will be familiar with the blasting plan and site-specific performance standards and give on-the-job training to persons who are not certified and who are assigned to the blasting crew or assist in the use of explosives.

Alton Coal Development LLC plans to use explosives as part of the overburden removal process; however there are no dwellings, public buildings, schools, churches, or community or institutional building with 1,000 feet of the planned blasting area in the initial (year 1) mining period. There are no underground mines with 500 feet of the permit. The anticipated blast design for blasts requiring more than five pounds of explosives or agents for blasts conducted within 1000 ft. of a dwelling, public building, school, church, or community or institutional building will be submitted for Division and MSHA approval, prior to blasting. The blast design will contain sketches of the drill and delay patterns, decking, type and amount of explosives required per blast, critical dimensions, design factors utilized to protect the public, general location drawings of protected structures, that meet the applicable airblast, flyrock, and ground vibration standards in 524.600.

The blast design will be prepared and signed by a Utah certified blaster.

524.300 - 350 Preblasting Survey

A preblasting survey will be conducted when more than five pounds of explosives or blasting agents are to be used. As part of the preblasting survey Alton Coal Development LLC will:

- Notify, in writing, all residents or owners of dwellings or other structures located within one-half mile of the permit area how to request a preblasting survey at least 30 days before initiation of blasting.

- Prepare a written report of any preblasting survey. A resident or owner of a dwelling or structure within one-half mile of any part of the permit area may request a preblasting survey. This request will be made, in writing, directly to Alton Coal Development LLC or to the Division, who will promptly notify Alton Coal Development LLC. Alton Coal Development LLC will promptly conduct a preblasting survey of the dwelling or structure and promptly prepare the written report. An updated survey of any additions, modifications, or renovation will be performed by Alton Coal Development LLC if requested by the resident or owner.
- Determine the condition of the dwelling or structure and will document any preblasting damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, and cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data.
- Require the written report of the survey be signed by the person who conducted the survey. Copies of the report will be promptly provided to the Division and to the person requesting the survey. If the person requesting the survey disagrees with the contents and/or recommendations contained therein, he or she may submit to both Alton Coal Development LLC and the Division a detailed description of the specific areas of disagreement.
- Complete any survey requested more than ten days before the planned initiation of blasting, before blasting occurs.

524.400 Blasting Schedule

524.420. Timing of Blasting

All blasting will be conducted between sunrise and sunset unless nighttime blasting is approved by the Division. Alton Coal Development LLC will conduct blasting operations at times approved by the Division and announced in the blasting schedule.

524.410. Unscheduled Blasts

Unscheduled blasts will be conducted only where public or operator health and safety so requires and for emergency blasting actions. When an unscheduled surface blast incidental to coal mining and reclamation operations is conducted, Alton Coal Development LLC, using audible signals, will notify residents within one-half mile of the blasting site and document the reason in accordance with 524.760.

524.450 - 453. Blasting Schedule Publication and Distribution.

Alton Coal Development LLC will:

- Publish the blasting schedule in a newspaper of general circulation in the locality of the blasting site at least ten days, but not more than 30 days, before beginning a blasting program;
- Distribute copies of the schedule to local governments and public utilities and to each local residence within one-half mile of the proposed blasting site described in the schedule; and
- Republish and redistribute the schedule at least every 12 months and revise and republish the schedule at least ten days, but not more than 30 days, before blasting whenever the area covered by the schedule changes or actual time periods for blasting significantly differ from the prior announcement; and

524.460 - 465. Blasting Schedule Contents.

The blasting schedule will contain, at a minimum:

- Name, address, and telephone number of operator;
- Identification of the specific areas in which blasting will take place;
- Dates and time periods when explosives are to be detonated;
- Methods to be used to control access to the blasting area; and
- Type and patterns of audible warning and all-clear signals to be used before and after blasting.

524.500 - 532 Blasting and Warning Signs, Access Control

Blasting signs will read **"Blasting Area"** and be conspicuously placed along the edge of any blasting area that comes within 100 feet of any public right-of-way, and at the point where any other road provides access to the blasting area. At all entrances to the mine permit area from public roads or highways, signs will be conspicuously placed which read **"Warning! Explosives in Use"**, clearly list and describe the meaning of the audible blast warning and all-clear signals in use, and explain the identification of blasting areas where charged holes await firing at the blasting site in the mine permit area.

Warning and all-clear signals of different character or pattern that are audible within a range of one-half mile from the point of the blast will be given. Each person within the permit area and each person who resides or works regularly within one-half mile of the blast site in the mine permit area will be notified of the meaning of the signals in the blasting schedule and notification.

Access within the blasting areas will be controlled to prevent presence of livestock or unauthorized persons during blasting and until an authorized representative of Alton Coal Development LLC has reasonably determined that no unusual hazards exist, such as imminent slides or un-detonated charges; and access to and travel within the blasting area can be safely resumed.

524.600 - 610 Adverse Effects Of Blasting

Blasting will be conducted to prevent injury to persons, damage to public or private property outside the mine permit area, and changes in the course, channels, or availability of surface or ground water outside the mine permit area.

524.620 Airblast Limits

Airblast will not exceed the maximum limits listed below at the location of any dwelling, public building, school, church, or community or institutional building outside the mine permit area, except for those structures and facilities owned by Alton Coal Development LLC as approved by the Division. Maximum airblast limits are as follows:

Lower Frequency Limit of Measuring System, HZ (+3dB)		Maximum Level dB
0.1 Hz or lower – flat response (1)		134 peak
2 Hz or lower – flat response		133 peak
6 Hz or lower – flat response		129 peak
C-weighed – slow response (1)		105 peak dBC

(1) Only when approved by the Division.

524.630. Monitoring:

Periodic monitoring will be conducted to ensure compliance with the airblast standards. Airblast measurements and will be taken as required by the Division at locations specified by the Division. The measuring system used will have an upper-end flat frequency response of at least 200 Hz.

524.633. Flyrock:

Flyrock traveling in the air or along the ground will not be cast from the blasting site more than one-half the distance to the nearest dwelling or other occupied structure; beyond the area of blasting access control or beyond the mine permit area boundary.

524.640 - 662. Ground Vibration.

In all blasting operations, except as otherwise authorized by the Division, the maximum ground vibration will not exceed the values approved by the Division. The maximum

ground vibration for protected structures will be in accordance with either the maximum peak-particle velocity limits, the scaled-distance equation, the blasting-level chart, or by the Division. All other structures in the vicinity of the blasting area such as water towers, pipelines and other utilities, tunnels, dams, impoundments, and underground mines will be protected from damage by establishment of a maximum allowable limit on the ground vibration. These limits will be submitted by Alton Coal Development LLC and approved by the Division prior to blasting. A seismographic record will be provided for each blast.

Maximum Peak-Particle Velocity Method: The maximum ground vibration will not exceed the following limits at the location of any dwelling, public building, school, church, or community or institutional building outside the mine permit area in accordance with the following:

Distance (D) from Blast Site in feet	Maximum allowable Particle Velocity (Vmax) for ground vibration, in inches/second (1)	Scaled distance factor to be applied without seismic monitoring (Ds) (2)
0 to 300	1.25	50
301 to 5,000	1.00	55
5,001 and beyond	0.75	65

(1) Ground vibration will be measured as the particle velocity. Particle velocity will be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity will apply to each of the three measurements.
(2) Applicable in the scale-distance equation of 524.651.

Scaled Distance Equation Method: Alton Coal Development LLC will use the scaled-distance equation, $W=(D/Ds)^2$, to determine the allowable charge weight of explosives to be detonated in any eight-millisecond period, without seismic monitoring: where W = the maximum weight of explosives, in pounds: D = the distance, in feet, from the blasting site to the nearest protected structure: and Ds = the scaled-distance factor, which may initially be approved by the Division using the values for scaled-distance factor listed in 524.642.

The development of a modified scaled-distance factor may be authorized by the Division on receipt of a written request by Alton Coal Development LLC, supported by seismographic records of blasting at the mine site. The modified scaled-distance factor of the predicted ground vibration will not exceed the prescribed maximum allowable peak particle velocity of 524.642 at a 95% confidence level.

Blasting-Level-Chart. Alton Coal Development LLC may use the ground-vibration limits in Figure 1 (Figure 1, showing maximum allowable ground particle velocity at specified frequencies, is incorporated by reference. Figure 1 may be viewed at 30 CFR 817.67 or at the Division of Oil, Gas and Mining State Office.) to determine the maximum allowable ground vibration. If the Figure 1 limits are used, a seismographic

record including both particle velocity and vibration-frequency levels will be provided for each blast. The method for the analysis of the predominant frequency contained in the blasting records will be approved by the Division before application of this alternative blasting criterion.

524.690. Standards not Applicable

The maximum airblast and ground-vibration standards of 524.620 through 524.632 and 524.640 through 524.680 will not apply at the following locations: At structures owned by Alton Coal Development LLC and not leased to another person; and at structures owned by Alton Coal Development LLC and leased to another person, if a written waiver by the lessee is submitted to the Division before blasting.

524.700 Records of Blasting Operations:

Blasting records will be maintained at the mine site for at least three years and upon request, records will be available for inspection by the Division or the public. A blasting record will contain the name of Alton Coal Development LLC; location, date, and time of the blast; name, signature, and Utah certification number of the blaster conducting the blast. It will also include the identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described in 524.690 and weather conditions, including those which may cause possible adverse blasting effects.

The blasting record will include: The type of material blasted; sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern; diameter and depth of holes; types of explosives used; total weight of explosives detonated in an eight-millisecond period; initiation system; type and length of stemming; and mats or other protection used.

If required, a record of seismographic and airblast information will include: type of instrument, sensitivity, and calibration signal or certification of annual calibration; exact location of instrument and the date, time, and distance from the blast; name of the person and firm analyzing the seismographic record; and the vibration and/or airblast level recorded; and the reasons and conditions for each unscheduled blast.

524.800 Use of Explosives:

Alton Coal Development LLC will comply with all appropriate Utah and federal laws and regulations in the use of explosives.

525. SUBSIDENCE CONTROL PLAN

Not applicable

526. MINE FACILITIES:

526.110-115 Existing Structures.

There are no existing structures within the permit area.

526.116. Public Roads:

526.116.1. Operations Within 100 ft. of a Public Road

Initial operations at the Coal Hollow Mine will be on the western edge of the property, west of Kane County Road #136. However during the initial mining period, coal mining and reclamation operations will not approach to within 100 feet of the right-of-way line of that road. During that initial mining period a mine haul road will cross the county road right-of-way to allow haulage of coal to the stockpile area. see Drawing 5-1. Site-specific Drawings will be updated

526.116.2 Relocating a Public Road:

Following the initial mining period, Alton Coal Development LLC will relocate Kane County Road #136 to a route that bypasses the permit area. The right-of-way of this relocated road will not be within 100 ft. of any mining operation. The design and route of the relocated road will be approved by Kane County authorities, or such other authorities as have jurisdiction. The current road will be barricaded to prevent entrance, and appropriate signs installed to protect the public. The proposed relocation options of Kane County Road #136 is shown on Drawing 5-1. Site-specific Drawings will be updated

526.200 Utility Installation and Support Facilities

526.210 Existing Utilities.

There are no known oil, gas, and water wells; oil, gas, and coal-slurry pipelines, railroads; electric and telephone lines; and water and sewage lines passing over, under, or through the permit area. Should such facilities be installed, mining and reclamation operations will be conducted in a manner that minimizes damage, destruction, or disruption of services provided by such facilities unless otherwise approved by the owner of those facilities and the Division.

526.220 Support Facilities

Mine support facilities will be operated in accordance with the permit issued for the Coal Hollow Mine. Planned support facilities are shown on Drawing 5-1 Site-specific Drawings will be updated

and consist of:

Number	Name	Description
1	Office	Modular office building, concrete footers
2	Shop	Metal building, concrete floor, concrete footers
3	Fuel Storage	Storage tanks, steel containment structure
4	Oil Storage	Storage tanks, steel containment structure
5	Coal Hopper	Steel structure, concrete base, concrete footers
6	Coal Crusher	Steel structure, concrete base, concrete footers
7	Coal Conveyor	Steel structure, concrete base, concrete footers
8	Coal Loadout	Steel structure, concrete base, concrete footers

During development and the initial mining phase, facilities of a temporary nature may also be used. These could include mobile type office and storage buildings, portable crusher and stacker facilities, and auxiliary diesel generators.

The support facilities will be located, maintained, and used in a manner that prevent or control erosion and siltation, water pollution, and damage to public or private property; and to the extent possible use the best technology currently available to minimize damage to fish, wildlife, and related environmental values; and minimize additional contributions of suspended solids to stream flow or runoff outside the mine permit area. Any such contributions will not be in excess of limitations of Utah or Federal law.

526.300 Water Pollution Control Facilities:

Water pollution associated with mining and reclamation activities within the permit areas will be controlled by:

- Construction of berms and/or diversion ditches to control runoff from all facilities areas.
- Roads will be constructed with ditches to capture all runoff
- Diversion ditches will be constructed as necessary around active mining and reclamation areas to capture runoff from those areas.
- Sedimentation ponds will be constructed to control discharges from all active areas of the mine site

Planned locations of water pollution control facilities are shown on Drawing 5-1. Site-specific Drawings will be updated

526.400 Air Pollution Control Facilities:

Air pollution (fugitive dust) emissions from mining and reclamation operations in the permit area will be controlled by a number of means, including:

- water sprays located at appropriate points on crushers, belt conveyors, hoppers, and transfer points.
- Haul roads will be maintained and will have water or other dust suppressants applied as appropriate.
- Road surfaces will be graded to stabilize/remove dust-forming debris as required.
- Areas adjoining primary roads will be stabilized and vegetated.
- Vehicular speeds will be controlled to minimize dusting conditions.
- Cleared vegetation debris within the mine area will be burned or otherwise disposed of in accordance with local guidelines.

527. TRANSPORTATION FACILITIES

527.100 Classification of Roads

All roads used for transporting coal or spoil outside the active mining area are classified as primary roads and all other roads outside the active mining area are classified as ancillary roads; see Drawing 5-1. . Site-specific Drawings will be updated

527.200 Description of Roads

Two primary haul roads will be constructed within the permit area. The first, oriented generally east-west will serve the initial mining area and the temporary spoil stockpile located east of the pit. The second road, oriented generally north - south will provide access between the pit and the surface facilities, and serve the southern portion of the mine area. Both of these roads will be constructed with a 90 ft wide road surface bounded by ditches and berms (when required for safe operation) as depicted on Figure XX. Road gradients outside the pit will not exceed 8%, and no significant cuts or fills are planned. Culverts will be installed to provide a road crossing over Robinson Creek in the SE1/4 of SE1/4 of Section 19.

The ramps, benches and equipment travel paths within the active surface mining area are temporary in nature and will be relocated frequently as mining progresses. These temporary travelways are considered part of the pit due to their short term use, and are not individually designed nor engineered. They will be built and maintained to facilitate safe and efficient mine and reclamation operations.

527.220 Alteration or Relocation of Natural Drainageways.

As currently planned, no natural drainageways will be altered or relocated due to road construction. If such alterations or relocations are necessary, appropriate measures will be taken to obtain Division approval for such alterations or relocations.

Mine development work will include a temporary diversion of Lower Robinson Creek away from the mining area. This diversion will be designed to meet all applicable criteria for such diversions, and appropriate plans, drawings and specifications submitted to the Division. The diversion will be in-place beginning with initial mine development work and continuing until mining and reclamation is complete in SW ¼, SE ¼ of Section 19. At currently planned production levels the stream will be re-established in it's original course late in mining year 2. That schedule will depend on channel design considerations and revegetation schedules.

527.230 Road Maintenance

All roads will be maintained on an as needed basis using motor graders, water trucks for dust suppression, and other equipment as necessary. Crushed stone will be used as a surface course for primary roads outside the active mining area, and may be used as needed for ramps and travelways within the pit. Should the roads be damaged by a catastrophic event, such as an earthquake or a flood, repairs will be made as soon as possible after the damage has occurred or the road will be closed and reclaimed.

527.250. Geotechnical Analysis

No alternative specifications or steep cut slopes associated with roads are anticipated outside the active mine area. A report of appropriate geotechnical analysis will be provided should such alternative specifications or steep cut slopes where approval of the Division is required, become necessary.

528. HANDLING AND DISPOSAL OF COAL, OVERBURDEN, EXCESS SPOIL, AND COAL MINE WASTE:

528.100. Coal removal, handling, storage, cleaning, and transportation areas and structures;

Coal handling activities are confined to the active pit, and the coal processing/loading areas located north of the pit. All areas and facilities will be designed and constructed, utilized and maintained in conformance with industry standards and all applicable regulations. At the conclusion of mining the facilities will be removed as part of final mine reclamation activities. Material from coal stockpile areas, and other areas of potential coal accumulation will be excavated and the excavated material placed in the final mined out pit.

528.200. Overburden;

Overburden will be excavated and disposed of in the pit in accordance with the approved mining plan. To the extent possible, and consistent with efficient operation of the pit, excavated overburden (spoil) will be hauled directly to the mined out pit, and placed in the backfill as part of ongoing reclamation.

Spoil material from the initial mining area will be placed in the temporary spoil pile in the SW ¼ of Section 20 T39S R5W. Placement of spoil in this area is expected to continue for 1 to 2 years, and the pile is planned to hold approximately 7.1 million cubic yards of excavated overburden. The planned material balance associated with this temporary pile is summarized:

		Spoil Stockpile		
Year	Direct Placed (LCY)	Added (LCY)	Removed (LCY)	Balance (LCY)
1	8,900,000	3,500,000	-	3,500,000
2	15,600,000	2,700,000	-	6,200,000
3	13,800,000	900,000	500,000	6,600,000
4			6,600,000	-

This temporary stockpile is needed to provide an area to place the overburden from the initial pit, and to provide material for backfilling of the final pit. Prior to construction of the stockpile, the area will be cleared of vegetation, and the topsoil removed and stockpiled. If necessary additional material will be removed to allow the temporary pile to rest on bedrock, and to enhance the stability of the pile. The pile will be seeded to prevent erosion, and any runoff will be confined to the mine area.

During the course of mining, some additional excavated overburden may be placed temporarily on mined over and backfilled areas due to operational considerations. This material will be re-excavated and moved to it's final placement location as operations allow.

528.300. Spoil, coal processing waste, mine development waste, and noncoal waste removal, handling, storage, transportation, and disposal areas and structures;

Not Applicable.

528.310. Excess Spoil.

As currently planned no excess spoil will be created by the Coal Hollow Mine. All spoil will be placed in the mined out pit, and the area returned to the planned post mining contour. Some spoil will be stored temporarily outside the pit, and utilized to backfill the final mine cut.

528.320. Coal Mine Waste.

Not Applicable

528.322. Refuse Piles.

Not Applicable

528.323. Burning and Burned Waste Utilization.

Not Applicable

528.330. Noncoal Mine Waste.

Noncoal mine wastes including, but not limited to, grease, lubricants, paints, flammable liquids, garbage, abandoned mining machinery, lumber and other combustible materials generated during mining activities will be placed and stored in a controlled manner in a designated portion of the permit area.

528.332.

Final disposal of noncoal mine wastes will be in a designated disposal site in the permit area or a State-approved solid waste disposal area. Disposal sites in the permit area will be designed and constructed to ensure that leachate and drainage from the noncoal mine waste area does not degrade surface or underground water. Wastes will be routinely compacted and covered to prevent combustion and wind-borne waste. When the disposal is completed, a minimum of two feet of soil cover will be placed over the site, slopes, stabilized, and revegetation accomplished in accordance with 244.200 and R645-301-353 through R645-301-357. Operation of the disposal site will be conducted in accordance with all local, Utah, and Federal requirements.

528.333.

At no time will any noncoal mine waste be deposited in a refuse pile or impounding structure, nor will any excavation for a noncoal mine waste disposal site be located within eight feet of any coal outcrop or coal storage area.

528.334.

Notwithstanding any other provision to the R645 Rules, any noncoal mine waste defined as "hazardous" under 3001 of the Resource Conservation and Recovery Act (RCRA) (Pub. L. 94-580, as amended) and 40 CFR Part 261 will be handled in accordance with the requirements of Subtitle C of RCRA and any implementing regulations.

528.340. Underground Development Waste.

Not Applicable

528.350. Acid-Forming and Toxic Materials

Debris, acid-forming, toxic-forming materials and materials constituting a fire hazard will be identified and disposed of in accordance with R645-301-528.330, R645-301-537.200, R645-301-542.740, R645-301-553.100 through R645-301-553.600, R645-301-553.900, and R645-301-747. Appropriate measures will be implemented to preclude sustained combustion of such materials; and

528.400. Dams, embankments and other impoundments.

529. **MANAGEMENT OF MINE OPENINGS.**

Not Applicable

530 OPERATIONAL DESIGN CRITERIA AND PLANS:

531 GENERAL:

Design drawings for all siltation structures, water impoundments, dams and embankment are contained in Appendix TBA. . Site-specific Drawings will be updated

Underground mining has not occurred within the permit area.

532 SEDIMENT CONTROL:

532.100 Disturbed Area:

The smallest practicable area, consistent with reasonable and safe mine operational practices will be disturbed at any one time during the mining operation and reclamation phases. This will be accomplished through progressive backfilling, grading, and prompt revegetation of disturbed areas.

532.200 Backfill Stabilization:

The backfilled material will be stabilized by grading and benching to promote a reduction of the rate and volume of runoff in accordance with the applicable requirements. Because the backfill will be placed in the mined out pit, and thus confined on all sides, the backfill will be inherently stable.

533. IMPOUNDMENTS.

533.100.

No impoundments meeting the NRCS Class B or C criteria for dams in TR-60, or the size or other criteria of 30 CFR Sec. 77.216(a) are planned for the Coal Hollow Mine.

533.110

Impoundments not included in 533.100, will be designed and constructed with a minimum static safety factor of 1.3 for a normal pool with steady state seepage saturation conditions or meet the requirements of R645-301-733.210.

533.200. Foundations.

Foundations for temporary and permanent impoundments will be designed so that

- Foundations and abutments for the impounding structure is stable during all phases of construction and operation. Such foundations for temporary and permanent impoundments will be designed based on adequate and accurate information on the foundation conditions
- All vegetative and organic materials will be removed and foundations excavated and prepared to resist failure. Cutoff trenches will be installed if necessary to ensure stability.
- Slope protection will be provided to protect against surface erosion at the site and protect against sudden drawdown.
- Faces of embankments and surrounding areas will be vegetated except that faces where water is impounded may be riprapped or otherwise stabilized in accordance with accepted design practices.
- The vertical portion of any remaining highwall will be located far enough below the low- water line along the full extent of highwall to provide adequate safety and access for the proposed water users.

533.600.

Not Applicable

533.610-620.

Not Applicable

533.700 - 714. Plans.

Each detailed design plan for structures not included in 533.610 shall:

- Be prepared by, or under the direction of, and certified by a qualified, registered, professional engineer, except that all coal processing waste dams and embankments covered by R645-301-536 and R645-301- 746.200 shall be certified by a qualified, registered, professional engineer;
- Include any design and construction requirements for the structure, including any required geotechnical information;
- Describe the operation and maintenance requirements for each structure; and
- Describe the timetable and plans to remove each structure, if appropriate.

534. ROADS

534.100-200 Roads will be located, designed, constructed, reconstructed, used, maintained, and reclaimed so as to:

- Prevent or control damage to public or private property;
- Use nonacid - or nontoxic-forming substances in road surfacing; and
- Have, at a minimum, a static safety factor of 1.3 for all embankments.
- Have a schedule and plan to remove and reclaim each road that would not be retained under an approved postmining land use.
- Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices.
- To ensure environmental protection and safety appropriate for their planned duration and use, including consideration of the type and size of equipment used, the design and reconstruction of roads will incorporate appropriate limits for grade, width, surface materials, and any necessary design criteria established by the Division.

534.300-340. Primary Roads.

Primary roads will:

- Be located, insofar as practical, on the most stable available surfaces;
- Be surfaced with rock, crushed gravel, asphalt, or other material approved by the Division as being sufficiently durable for the anticipated volume of traffic and the weight and speed of vehicles using the road;
- Be routinely maintained to include repairs to the road surface, blading, filling potholes and adding replacement gravel or asphalt. It will also include revegetation, brush removal, and minor reconstruction of road segments as necessary; and
- Have culverts that are designed, installed, and maintained to sustain the vertical soil pressure, the passive resistance of the foundation, and the weight of vehicles using the road.

535. **SPOIL**

535.100. Disposal of Excess Spoil.

Not Applicable

535.200. Disposal of Excess Spoil: Valley Fills/Head-of-Hollow Fills.

Not Applicable

535.300. Disposal of Excess Spoil: Durable Rock Fills.

Not Applicable

535.400. Disposal of Excess Spoil: Preexisting Benches.

Not Applicable

535.500. Faceup operations for underground coal mine development.

Not Applicable

536. Coal Mine Waste.

Not Applicable

537 REGRADED SLOPES:

537.100 Geotechnical Analysis:

Slope stability analysis for the reclamation grades and the temporary spoil storage areas are provided in Appendix . Site-specific Drawings will be updated

540 RECLAMATION PLAN:

541.100 - 400 General

When coal mining is completed, all pits will be permanently backfilled and reclaimed in accordance with the R645 rules and this permit. All equipment, structures, and other facilities, unless approved by the Division as suitable for the postmining land use or environmental monitoring, will be removed and the affected land reclaimed.

There are no known underground openings, equipment or facilities located within the permit area.

542 NARRATIVE, DRAWINGS AND PLANS:

542-100 through 200 Plan and Timetable.

Reclamation at the Coal Hollow Mine will includes both ongoing reclamation and final reclamation activities. Ongoing reclamation will follow mining operations as closely as practicable during the mine production phase. Major steps in the ongoing reclamation process are:

- Backfilling and Grading. The planned backfilling and grading operations are described more fully under section 553 below.
- Topsoil Replacement. Following grading, topsoil will be replaced on the regraded area. Topsoil may be direct placed from areas ahead of the mine, or may be taken from available stockpiled material. The planned topsoil operation will have topsoil ahead of the operation dozed into windrows, and loaded into trucks by a front end loader. The trucks will haul the topsoil to the regraded area, or to a temporary topsoil stockpile. Once dumped on the regraded area the topsoil will be dozed to a consistent thickness. Approximately 15 inches of topsoil is expected to be replaced over the regraded area. Once in place, the area will be fine graded by a motor grader to remove small erosion features and depressions.
- Revegetation. Following replacement of topsoil the area will be revegetated by mulching and seeding.

Generally mined areas will be backfilled and graded within approximately 180 days following coal removal, or 1,500 feet of the active coal removal face. Areas needed for

in-pit roads, ramps, drainage controls or areas which must be left open temporarily for operational reasons will be backfilled and graded as they become available. The rate of backfilling will depend on the availability of mined out pit areas for backfilling, and the rate of production at the mine.

Topsoil will be replaced on the graded areas as soon as operationally practicable. This work will depend on weather and soil conditions in the removal and replacement areas, but is generally anticipated to occur within 90 days of completion of regrading.

Revegetation activities will be seasonal in nature. As currently planned, initial seeding will occur at the first planting opportunity following replacement of topsoil. Supplemental seeding may be done subsequently as needed.

Some delay is unavoidable in reclamation of the initial mining areas due to the time required to establish the initial working pit and backfill area, and to achieve a steady state excavation/backfill operation. As currently planned the initial mining areas will be backfilled to the planned post mining contour, graded, and the topsoil replaced by late in the first year or early in the second year of mining. Reclamation activities will proceed at the regular planned rate thereafter.

The planned ongoing reclamation sequence is illustrated on Drawing TBA. Site-specific Drawings will be updated

The sequence and timing of reclamation activities is dependent on the coal production rate. Should that rate differ significantly from the current plan, the reclamation schedule will also vary.

Final reclamation includes the following:

- Backfilling and Grading. Backfilling of all final pits will commence at the conclusion of coal production. All highwalls, spoil piles, and depressions will be removed, except that small depressions may be constructed if they are needed to retain moisture, minimize erosion, create and enhance wildlife habitat, or assist revegetation. No permanent final pit impoundments are currently planned. Material from the temporary spoil storage area will be used to backfill the final pits and any remaining low areas in the regraded spoil. All exposed coal seams, and acidic or toxic-forming strata will be covered.
- Topsoil Replacement. Topsoil will be replaced on the final pit and other disturbed areas (including facilities sites, roads etc.).
- Removal of Structures. Before abandoning the permit area or seeking bond release, all structures not needed for the approved post mining land use will be removed and reclaimed. No permanent structures are planned for the mine area. Coal accumulations from the stockpile area and other areas where coal may

accumulate will be excavated and placed in a controlled manner in the final pit and covered with noncombustible material to prevent sustained combustion.

- Removal of Roads. Roads not to be retained for use under an approved postmining land use will be reclaimed immediately after they are no longer needed for mining and reclamation operations. Roads no longer needed will be closed to traffic; and all bridges and culverts removed, unless approved as part of the postmining land use. Prior to reclamation, surface material that is incompatible with the postmining land use and revegetation requirements will be removed from the roads and properly disposed of at the mine site. The roadbeds will be scarified or ripped to break up the surface. Topsoil will be replaced on the roadbed and the surface revegetated in accordance with the standards set forth in R645.
- Removal of Water Control Structures. All sedimentation control structures, including ditches, berms and sedimentation ponds not retained as part of approved the post-mining land use will be removed, the areas regraded, topsoiled, and revegetated. Prevention of water pollution will require that some of these structures be left in-place until permanent vegetative cover is established, and thus may not be removed for some years after the conclusion of mining.

Final pit backfilling, removal of buildings, roads and other facilities, along with replacement of topsoil is expected to require approximately 2 months after the last coal is removed.

542.700. Final Abandonment of Mine Openings.

Not Applicable

542.720. Disposal of Excess Spoil.

Not Applicable

542.730. Disposal of Coal Mine Waste.

Not applicable

542.740. Disposal of Noncoal Mine Wastes.

Noncoal mine waste including, but not limited to grease, lubricants, paints, flammable liquids, garbage, abandoned mining machinery, lumber and other combustible materials generated during mining activities will be placed and stored in a controlled manner in a designated portion of the permit area and/or hauled offsite to a state approved recycling or solid waste disposal site. If retained on-site, placement and storage will ensure that fires are prevented, and that the area remains stable and suitable for reclamation and revegetation compatible with the natural surroundings. Wastes will be routinely compacted and covered to prevent combustion and wind-borne waste. When the disposal

is completed, a minimum of two feet of suitable cover will be placed over the site, slopes stabilized, and revegetation accomplished. Operation of the disposal site will be conducted in accordance with all local, Utah, and federal requirements.

542.800. Reclamation Cost.

Estimates of reclamation costs are included in Appendix 8-1

550. RECLAMATION DESIGN CRITERIA AND PLANS

551. SEALING AND CASING OF UNDERGROUND OPENINGS

Not Applicable

552. PERMANENT FEATURES.

Not Applicable

553 BACKFILLING AND GRADING:

Backfilling and Grading of the mined area will proceed in conjunction with coal recovery operations. Upon completion of mining, all mined areas will be backfilled to the planned post-mining contour.

The planned mine will recover approximately 5.9 million tons of coal, and remove approximately 33.9 million Bank Cubic Yards (BCY) of overburden. The resulting material balance in the reclaimed area is calculated as follows:

Coal Removed (Tons)	5,900,000
Coal Density (BCY/Ton)	0.925
Coal Volume Removed (CY)	5,458,000
Overburden Removed (BCY)	33,850,000
Total Void Area (CY)	39,309,000
Overburden Swell	25%
Overburden Re-compaction	5%
Net Overburden Swell (1.25*.95)	19%
Net Spoil Volume (33,850,000*1.19)	40,281,000
Net Additional Volume (CY)	972,000
Net Contour Elevation Difference (ft.)	2.7

As shown, the spoil swell approximately offsets the volume of coal removed, and as a result the additional spoil volume is minimal, equivalent to an elevation change over the mine area of less than 3 ft. As a result, the additional spoil volume can be distributed over the mined area while still achieving approximate original contour, and no excess spoil is created by the operation.

Backfilling and grading operations will follow coal removal operations as closely as practicable. Major steps in the backfilling and grading process are:

- Backfilling of the Mined Out Pit. Material from active pits will be used to backfill mined out pits as mining progresses. Material will be placed in the in-pit backfill in lifts, until the approximate planned final elevation is reached. Working stability in the backfill will be achieved by placement of the material, and control of the overall spoil face slope at stable angles. The mined out area will be filled to its planned post-mining elevation, which approximates the pre-mining land contour. The backfill will be inherently stable because the exposed surface will have only very shallow slopes, and the backfill surface will not be significantly higher than the surrounding undisturbed ground.
- Backfilling of Ramps. Ramps and travelways within the active mining will be moved as necessary for safe operation and efficient hauling of overburden and coal. When a particular ramp or travelway is no longer needed, it will be backfilled with excavated overburden from the advancing pit.

- Grading. After backfilling is complete in each mined out area, the area will be graded using dozers and motor graders to achieve the planned post-mining contour, facilitate stable positive drainage patterns, and to blend in with the surrounding topography. Postmining slopes will not exceed either the angle of repose or such lesser slope as is necessary to achieve a minimum long-term static safety factor of 1.3 and prevent slides. Post mining slopes are planned at angles of 10% or less, and it is anticipated that geotechnical investigations will find those slopes stable.

Timing of backfilling and grading operations will depend on the rate of mine advance and the availability of backfill space and material. Generally it is planned that mined areas will be backfilled and graded within approximately 180 days following coal removal, or 1,500 feet of the active coal removal face. Areas needed for in-pit roads, ramps, drainage controls or areas which must be left open temporarily for operational reasons will be backfilled and graded as they become available.

Some delay is unavoidable in backfilling the initial mining areas due to the time required to establish the initial working pit and backfill area, and to achieve a steady state excavation/backfill operation. As currently planned the initial mining areas will be backfilled to the planned post mining contour, graded, and the topsoil replaced by late in the first year or early in the second year of mining. Reclamation activities will proceed at the regular planned rate thereafter.

553.200 Spoil and Waste.

Not Applicable

553.300. Covering of Exposed Coal Seams, and Acid- and Toxic-Forming Materials.

Exposed coal seams, acid- and toxic-forming materials, and combustible materials exposed, used, or produced during mining will be adequately covered with nontoxic and noncombustible materials, or treated, to control the impact on surface and ground water in accordance with R645-301-731.100 through R645-301-731.522 and R645-301-731.800, to prevent sustained combustion, and to minimize adverse effects on plant growth and on the approved postmining land use.

553.400. Cut and Fill Terraces

Not Applicable

553.500. Previously Mined Areas (PMA's) and Continuously Mined Areas (CMA's).

Not Applicable

553.600. Highwall Management

Not Applicable

553.700. Backfilling and Grading: Thin Overburden.

Not Applicable

553.800. Backfilling and Grading: Thick Overburden.

Although estimates of coal thickness and overburden thickness and swell factors indicate there will nominally be more spoil than needed to achieve the original contour, the final reclamation plan provides for approximate original contour, a surface configuration that closely resembles the topography of the land prior to mining, and which can be blended in to complement the drainage pattern of the surrounding terrain. Thus reclamation can be carried out to comply with the requirements of R645-301-537.200, R645-301-552 through R645- 301-553.230, R645-301-553.260 through R645-301-553.420, R645-301-553.600, and R645-301-553.900 to achieve the approximate original contour, and this section does not apply.

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Chapter 6

R645-301-600

Geology

R645-301-600 GEOLOGY

R645-301-610 INTRODUCTION

This section describes the geologic conditions in the Coal Hollow Project and adjacent areas

611. GENERAL REQUIREMENTS

A characterization of the geology within and adjacent to the permit area is given in sections R645-301-621 and R645-301-627. A description of the proposed operating plan for the casing and sealing of exploration holes and boreholes is presented in R645-301-630.

612 CERTIFICATION OF CROSS SECTIONS, MAPS, AND PLANS

All cross sections, maps and plans as required by R645-301-622 have been prepared and certified as described under R645-301-512.100.

R645-301-620 ENVIRONMENTAL DESCRIPTION

R645-301-621 GENERAL REQUIREMENTS

Description of Regional Geology

The coal to be mined at the Coal Hollow Project area is of Cretaceous age and resides in the Alton Coal Field of southwestern Utah. The Alton Coal Field is a roughly horseshoe-shaped region that is situated between the Kaiparowits Coal Field to the east, and the Kolob Coal Field to the west.

The topography in the Alton Coal Field is marked by bench and slope topography. Topographic relief in the region is approximately 2,800 feet, with elevations ranging from about 9,300 feet on top of the Paunsaugunt Plateau, to about 6,500 feet in the valley bottoms. The economic coal seams are located primarily along the western and southern flanks of the Paunsaugunt Plateau.

The geologic history, geology, stratigraphy, and structure of the Alton Coal Field have been described by Doelling (1972) and Tilton (2001) and are summarized below. A map of geologic formations exposed at the surface in the Coal Hollow Project area is shown in Drawing 6-1. A cross-section showing the regional geologic conditions in the Alton Coal Field is presented in Drawing 6-2.

Geologic History

During the Jurassic, sediment deposition into a slowly subsiding basin occurred, mostly by fluvial or eolian mechanisms. Later, during the Upper Jurassic, the area was intermittently inundated by a shallow, restrictive sea, with the accompanying deposition of sediments eroded from Mesozoic rocks to the south and west. Subsequently, prior to the end of the Lower Cretaceous, a broad uplift centered west of the Paunsaugunt area occurred, resulting in the erosion of the uplifted areas. Subsequently, to the east, the rock sequence down to the Entrada Formation was eroded away. To

the west, the rock sequence down to the Carmel was eroded away. After additional erosion of the region occurred, during the latest Cretaceous or earliest Upper Cretaceous, the land subsided and the region was covered with sediments. The source of these sediments lay mostly to the west and perhaps also to the south. As the Cretaceous Interior Seaway migrated westward, rock deposition occurred in fluvial, paludal, lagoonal and perhaps nearshore marine environments during transgressions and regressions of the seaway. This deposition resulted in the formation of the rocks of the Dakota Formation, which include the economic coal seams of the Alton Coal Field. The two principal coal seams of the Dakota Formation were formed during this period, one near the beginning and the other near the end of Dakota time. After the deposition of the Dakota Formation, the area experienced marine conditions as the Cretaceous Interior Seaway encroached westward toward eastern Iron County, resulting in the deposition of the marine shales of the Tropic Shale. After the subsequent eastward regression of the seaway, nearshore sand deposition occurred, resulting in the deposition of the Straight Cliffs Formation. Deposition of the Wahweap and Formation occurred as floodplains developed and an alternating sequence of sandstones and shales was deposited. Subsidence then ceased for a time and uneven erosion of the region occurred. Subsequent fluvial deposition resulted in the deposition of the Kaiparowits Formation on the erosional surface. Later, in the early Tertiary period, the area subsided and was filled with a lake in which the carbonate sediments of the Claron Formation were deposited. Thereafter, volcanism became active to the west and spread to the margins of the Paunsaugunt. Various agglomerates and volcanic breccias were deposited along the western margin of the plateau. Late in the Tertiary period, the Sevier and Paunsaugunt Fault systems became active. During the Pleistocene, several cinder cones developed which extruded olivine basalts. These include Bald Knoll, Buck Knoll, and others.

Stratigraphy

Stratigraphic units present in the Alton Coal Field area are described in ascending order below. A stratigraphic column showing these geologic formations is shown in Drawing 6-3. A diagrammatic correlation of Cretaceous units in southern and south-central Utah is shown in Drawing 6-4.

Navajo Sandstone (Lower Jurassic)

The Navajo Sandstone is a light gray to tan, locally cross-bedded massive eolian sandstone that underlies the region. Where exposed south of the Alton area, it forms the regionally prominent White Cliffs topographic feature. The Thousand Pockets Tongue of the Navajo Sandstone intertongues with the overlying Carmel Formation. Thickness of the Navajo Sandstone exceeds 1,000 feet in the Paunsaugunt Plateau region. The Navajo Sandstone does not crop out in the Coal Hollow Project area.

Carmel Formation (Upper Jurassic)

The Carmel Formation unconformably overlies the Navajo Sandstone in the region. The Carmel Formation is heterogeneous and consists of limestone, siltstone, sandstone, and gypsum beds. The formation has been subdivided into several members by previous researchers. These include the

Wiggler Wash Member, the Winsor Member, the Paria River Member, the Crystal Peak Member, and the Kolob Limestone Member. The thickness of the Carmel Formation ranges from about 650 to 800 feet in the Alton Coal Field area and the formation thickens to the west. The Winsor Member of the Carmel Formation crops out in the bottom of the Kanab Creek drainage in the southernmost portion of the Coal Hollow Project area.

Entrada Sandstone (Upper Jurassic)

The Entrada Sandstone, which may be as thick as 500 feet regionally, is present above the Carmel Formation in the eastern portion of the Alton Coal Field. The formation consists predominantly of siltstone and cross-bedded or fine-grained massive sandstone. The formation is not present in the Coal Hollow Project area.

Dakota Formation (Cretaceous)

The Dakota Formation contains the economic coal seams in the Alton Coal Field. The formation consists of fine- to medium-grained sandstone with interbedded gray shale, carbonaceous shale, and coal. In most locations, shaley strata dominate the formation, comprising about 60 to 75 percent of the formation. The unit characteristically forms ledge and slope topography. In the Coal Hollow Project area the Dakota Formation directly overlies the Carmel Formation. Regionally, the outcrop of the Dakota Formation forms the Gray Cliffs topographic feature. The economic coal seams in the Alton Coal Field are present near the base (Bald Knoll coal zone) and near the top of the formation (Smirl coal zone). Local thinner coal seams that are not of economic importance are present in the center of the formation. The thickness in the western portion of the Alton Coal Field is about 450 feet. In the eastern portion of the Alton Coal Field, the Dakota Formation is about 150 feet thick and rests on the Entrada Sandstone.

Tropic Shale (Cretaceous)

The Tropic Shale consists predominantly of gray and carbonaceous silty shale with a few marine sandstone beds. The formation typically weathers at the surface to a clayey soil that typically forms gentle, vegetated slopes. The Tropic Shale is present (in some locations covered with shallow alluvial or colluvial deposits) at the land surface over most of the Coal Hollow Project area. The formation was deposited in an open-marine offshore environment during the maximum westward transgression of the Cretaceous Western Interior Seaway in the Late Cretaceous (Tilton, 2001). Near the top of the formation, more sandy horizons are interbedded with the mudstone units of the formation. These sandy units together with the sandstone at the base of the overlying Straight Cliffs Formation reflect the initial sand influx onto the marine environment of the Tropic Shale. The thickness of the Tropic Shale in the Alton Quadrangle is about 700 feet.

Straight Cliffs Formation (Cretaceous)

The Straight Cliffs Formation is approximately 1,200 feet thick in the Alton Quadrangle. The formation is comprised predominantly of calcite-cemented sandstone and mudstone, with sandstone composing about 75 percent of the total composition. The sandstones of the Straight Cliffs Formation make up the lower two-thirds of the ledges radiating out from the southern Paunsaugunt Plateau. Four members of the Straight Cliffs Formation have been identified in the Alton Quadrangle by Tilton (2001). These include the Tibbet Canyon Member (orange-gray weathering fine- to medium grained sandstone), the Smoky Hollow Member (interbedded sandstone, mudstone, and thin coal), the John Henry Member (interbedded mudstone and fluvial sandstone), and Drip Tank Member (light-gray cliff forming sandstone). The Straight Cliffs Formation outcrops on the hillsides east and north of the Coal Hollow Project area.

Wahweap and Kaiparowits Formations (Cretaceous)

The Wahweap Formation is composed of alternating sandy shales and thin- to thick-bedded sandstones. The unit contains carbonaceous shale and thin coal beds that are not of economic importance in its lower part. The unit forms step-like topography. Regionally, the Wahweap Formation is separated from the overlying Kaiparowits Formation by an unconformity. Erosion of both the Wahweap and Straight Cliffs Formations prior to the deposition of the Kaiparowits Formation may have locally reduced the thicknesses of these formations in the vicinity of the Paunsaugunt Plateau. The Kaiparowits Formation is composed of irregular beds of arkosic sandstone. The sandstone is weakly cemented by calcite cement. Because of difficulties identifying mappable boundaries between the Wahweap and Kaiparowits Formations in the Alton Quadrangle, the formations were mapped as an undivided unit (Tilton, 2001). The total thickness of the Wahweap and Kaiparowits Formations in the Alton Quadrangle ranges from about 600 to 800 feet.

Claron Formation (Tertiary)

The Claron Formation (also sometimes known as the Wasatch Formation, although the Utah Geological Survey uses the name Claron Formation) forms the cap rock over much of the Paunsaugunt Plateau. The formation is also present west of the Sevier Fault Zone west and north of the town of Alton. The unit is subdivided into a lower pink (also known as red) member and an upper white member, both consisting mostly of massive, fine-grained crystalline limestone of fluvial and lacustrine origin. Resistance to erosion varies both vertically and horizontally in the Claron Formation, resulting in a series of cliffs and steep joints. This condition, together with the presence of closely spaced joints, produces the unique topography associated with the Claron Formation. The Claron Formation is about 800 thick in the Alton Quadrangle. Also mapped together with the Claron Formation in the Alton Quadrangle is the Cretaceous Canaan Peak Formation. The Canaan Peak is a thin, discontinuous formation consisting primarily of conglomerate and conglomeratic sandstone with some mudstone interbeds sometimes present at the base of the Claron Formation. Thickness of the Canaan Peak Formation locally ranges from 0 to 30 feet.

Brian Head Formation (Tertiary)

The Brian Head Formation consists of interbedded pink and purplish-gray very fine-grained sandstone, friable sandstone, conglomerate, siltstone, mudstone, and limey mudstone in its lower part, and gray to white, fine- to medium-grained sandstone and calcarenite, in part with a volcanically derived clay matrix. The formation includes rocks present above the underlying white member of the Claron Formation and the overlying ash-flow tuff of the Needles Range Group. The unit is not resistant to erosion and has been eroded away from the top of the Paunsaugunt Plateau in the Alton Quadrangle. The formation is present in the rugged hills west of the Sevier Fault Zone near the town of Alton. The unit is about 200 feet thick in the Alton Quadrangle.

Quaternary Deposits

Quaternary deposits present in the area include pediment alluvium, landslide deposits, mass-wasting debris, and alluvium.

The pediment alluvium deposits in the region consist of poorly sorted alluvial and colluvial silt, sand, and gravel deposited on broad pediments. After deposition, the pediment surfaces were abandoned as streams have cut down to lower levels.

Landslide deposits in the area are primarily gravity-transported hummocky deposits of mud, sand, and occasional blocks of sandstone. Most of the landslide deposits originated from the lower portion of the Straight Cliffs Formation and slid onto the underlying Tropic Shale, although movement within the Tropic Shale has also occurred. A conspicuous series of progressively built landslide deposits is present east of the Alton Amphitheater as a broad, rolling apron below the lowest cliffs of the Straight Cliffs Formation. The thickness of the landslide deposits locally ranges from a few feet to more than 100 feet.

Alluvium deposits in the region consist of unconsolidated clay, silt, sand, and gravel in and near existing drainages. These deposits exist as stream and fan alluvium and terrace deposits. In the headwaters of the mountain streams, the alluvial material consists predominantly of sand and gravel. In downstream areas, the alluvial material consists mostly of mud derived from the Tropic Shale. Alluvial thickness in the Alton Quadrangle typically ranges from a thin covering to about 10 feet or more.

Additionally, an igneous dike consisting of black, fine-grained porphyritic olivine basalt is present northeast of Alton near Kanab Creek.

Structure

Rock strata in the region dip gently toward the north and north-east, generally from 1 to 5 degrees. The Alton Coal Field is bounded on the east by the Paunsaugunt Fault, on the west by the Sevier Fault. Regional displacements on these two faults are about 1,000 to 2,000 feet, and 100 to 800 feet, respectively. Additionally, several faults with lesser displacements have been mapped in the

region, including the Sand Pass Fault zone (about 400 feet of offset), the Bald Knoll Fault (about 650 feet of offset), and the Sink Valley Fault. Most local faults in the Alton Quadrangle trend in a northerly or north-westerly direction, are several miles long, and are near vertical. A preminent north- to northwest-trending vertical joint set is present in the Upper Cretaceous sandstone rocks in the region. Stratal dips vary appreciably near the fault zones.

Description of Coal Seam Geology

The coal seams in the Alton Coal Field are located in the Smoky Hollow Member of the Straight Cliffs Formation, and in the Dakota Formation. The coal seam in the Smoky Hollow Member, which occurs within the lower 3 feet of the Member, is only a few inches in thickness and is not of economic importance. Within the Dakota Formation, two regionally important coal zones are present. These include the Smirl coal zone, which is located near the upper formational contact with the Tropic Shale, and the Bald Knoll coal zone, which is located about 200 feet below the Smirl coal zone near the base of the Dakota Formation. Some previous researchers have included the Smirl coal zone as part of the overlying Tropic Shale.

The coal in the Alton Coal Field is reported to have an apparent rank of sub-bituminous B, with an average heating value of about 9,560 Btu, an average sulfur content of 1.0 percent, and an average ash content of 7.2 percent (Tilton, 2001). Doelling (1972) reports that coal in the Alton area is a high-volatile C Bituminous coal. Doelling also reports that a coal sample from the Smirl Mine contained 0.56 percent sulfur: 0.01 percent sulfate, 0.11 percent pyritic sulfur, and 0.44 percent organic sulfur. The sample also contained 18.5 percent moisture and 6.3 percent ash.

Doelling (1972) reported that the Smirl coal zone is 14 to 18 feet thick without splits, while the Bald Knoll coal zone contains several coal seams separated by thin splits, with the thickest seam being 4.8 feet thick. Within the Alton Quadrangle, five small mines and two prospects have been worked. Production from these mines was small, with a total production from all mines of 35,000 and 50,000 tons from the late 1920s to 1969, when the last mine closed. The last operating mine in the Alton Coal Field was the Smirl Mine, which was located about 1.5 miles south of the town of Alton. In its last year of operation, a total of 1,597 tons of coal was produced. The Smirl Mine portal was sealed by the Utah Division of Oil, Gas and Mining in 1992.

622 CROSS-SECTIONS, MAPS AND PLANS

622.100
Elevations of the coal seam to be mined and locations of drill holes are listed in Table 6-1 and shown in Drawing 6-5. Drill hole collar elevations and intervals cored and plugged are shown in Table 6-1.

622.200
The depth and thickness of surrounding strata are shown on a stratigraphic column in Drawing 6-3. Additional information regarding thicknesses of strata in the Coal Hollow Project area from drilling information is given in Appendix 6-1. Information on the thickness of the Smirl coal zone is listed

Table 6-1 Drill hole information.

Drill hole number	Land coordinates UTM Z12 NAD 27 (easting, northing)	Collar elevation (feet)	Total depth of hole (feet)	Overburden thickness (feet)	Elevation of top of coal seam (feet)	Coal seam thickness, Smirl zone (feet)	Cored interval (feet)	Plugged interval (feet)
CH-01-05	4139959, 371167	6863	80	59.2	6803.8	13.8	40-80	0-80
CH-03-05	4139608, 370977	6855	63.5	46	6809	15	41-63.5	0-63.5
CH-05-05	4139608, 371651	6927	175	154.7	6772.3	16.8	40-175	0-175
CH-06-05	4138401, 371434	6853	83.5	62.3	6790.7	17.2	40-83.5	0-83.5

in Table 6-1. Two cross-sections through the Coal Hollow Project area, showing stratigraphic relationships, approximate overburden thickness, and coal seam thickness, together with a location map are presented in Drawings 6-6 and 6-7.

Representative drill hole logs depicting the nature, depth and thickness of the coal seam to be mined and rider seams in the overlying strata and the nature of the Dakota Formation strata immediately below the coal seam to be mined are presented in Appendix 6-1. No rider seams are present in the overburden strata in the proposed coal mining area.

622.300
The outcrop line of the seam to be mined (Smirl coal zone) is shown on the geologic map in Drawing 6-1. The strike and dip of the Smirl coal seam in the permit area is also shown on Drawing 6-1.

622.400
No oil and gas wells exist within the proposed permit area.

623 GEOLOGIC INFORMATION

623.100 Acid or Toxic-Forming Strata
Analyses have been performed on strata above and below the coal seam to be mined. Information on acid and toxic forming potential is included in Appendix 6-2. Based on the information in Appendix 6-2 there is no indication that appreciable potential for acid or toxic formation is likely.

It is anticipated that coal produced from the Coal Hollow Project area will be shipped as a mine-run product. Thus, no coal processing wastes are anticipated.

623.200 Reclamation Feasibility

It is anticipated that successful reclamation of the site will be feasible. Several investigations involving reclamation of surface disturbed areas in the vicinity have been performed by other entities. These included the use of test plots to measure reclamation feasibility and success. The results of these investigations have been presented in published documents (Ferguson and Frischknecht 1985; USDI 1975). These investigations have demonstrated the feasibility of successful reclamation in the area.

A small-scale exploration/demonstration pit in the Coal Hollow Project area is planed for construction during the 2006 field season. One of the primary purposes of this exploration/demonstration pit will be to demonstrate and evaluate the reclamation feasibility of disturbed lands in the proposed permit area and to refine reclamation methods and techniques that will be used in the Coal Hollow Project area. Information gained from this activity will be submitted to the Division upon its completion.

623-300 Subsidence Control Plan

The proposed mining in the Coal Hollow Project area does not include underground coal mining activities. This section is not applicable.

624 GEOLOGIC DESCRIPTION

624.100 Regional and Structural Geology

The coal to be mined at the Coal Hollow Project area is of Cretaceous age and resides in the Alton Coal Field of southwestern Utah. The Alton Coal Field is a roughly horseshoe-shaped region that is situated between the Kaiparowits Coal Field to the east, and the Kolob Coal Field to the west.

The topography in the Alton Coal Field is marked by bench and slope topography. Topographic relief in the region is approximately 2,800 feet, with elevations ranging from about 9,300 feet on top of the Paunsaugunt Plateau, to about 6,500 feet in the valley bottoms. The economic coal seams are located primarily along the western and southern flanks of the Paunsaugunt Plateau.

The geology, stratigraphy, and structure of the Alton Coal Field have been described by Doelling (1972) and Tilton (2001) and are summarized below. A map of geologic formations exposed at the surface in the Coal Hollow Project area is shown in Drawing 6-1. A cross-section showing the regional geologic conditions in the Alton Coal Field area is presented in Drawing 6-2.

Stratigraphy

Stratigraphic units present in the Alton Coal Field area are described in ascending order below. A stratigraphic column showing these geologic formations is shown in Drawing 6-3. A diagrammatic correlation of Cretaceous units in southern and south-central Utah is shown in Drawing 6-4.

Navajo Sandstone (Lower Jurassic)

The Navajo Sandstone is a light gray to tan, locally cross-bedded, massive eolian sandstone that underlies the region. Where exposed south of the Alton area, it forms the regionally prominent White Cliffs topographic feature. The Thousand Pockets Tongue of the Navajo Sandstone intertongues with the overlying Carmel Formation. Thickness of the Navajo Sandstone exceeds 1,000 feet in the Paunsaugunt Plateau region. The Navajo Sandstone does not crop out in the Coal Hollow Project area.

Carmel Formation (Upper Jurassic)

The Carmel Formation unconformably overlies the Navajo Sandstone in the region. The Carmel

Formation is heterogeneous and consists of limestone, siltstone, sandstone, and gypsum beds. The formation has been subdivided into several members by previous researchers. These include the Wiggler Wash Member, the Winsor Member, the Paria River Member, the Crystal Peak Member, and the Kolob Limestone Member. The thickness of the Carmel Formation ranges from about 650 to 800 feet in the Alton Coal Field area and the formation thickens to the west. The Winsor Member of the Carmel Formation crops out in the bottom of the Kanab Creek drainage in the southernmost portion of the Coal Hollow Project area.

Entrada Sandstone (Upper Jurassic)

The Entrada Sandstone, which may be as thick as 500 feet regionally, is present above the Carmel Formation in the eastern portion of the Alton Coal Field. The formation consists predominantly of siltstone and cross-bedded or fine-grained massive sandstone. The formation is not present in the Coal Hollow Project area.

Dakota Formation (Cretaceous)

The Dakota Formation contains the economic coal seams in the Alton Coal Field. The formation consists of fine- to medium-grained sandstone with interbedded gray shale, carbonaceous shale, and coal. In most locations, shaley strata dominate the formation, comprising about 60 to 75 percent of the formation. The unit characteristically forms ledge and slope topography. In the Coal Hollow Project area the Dakota Formation directly overlies the Carmel Formation. Regionally, the outcrop of the Dakota Formation forms the Gray Cliffs topographic feature. The economic coal seams in the Alton Coal Field are present near the base (Bald Knoll coal zone) and near the top of the formation (Smirl coal zone). Local thinner coal seams that are not of economic importance are present in the center of the formation. The thickness in the western portion of the Alton Coal Field is about 450 feet. In the eastern portion of the Alton Coal Field, the Dakota Formation is about 150 feet thick and rests on the Entrada Sandstone.

Tropic Shale (Cretaceous)

The Tropic Shale consists predominantly of gray and carbonaceous silty shale with a few marine sandstone beds. The formation typically weathers at the surface to a clayey soil that typically forms gentle, vegetated slopes. The Tropic Shale is present (in some locations covered with shallow alluvial or colluvial deposits) at the land surface over most of the Coal Hollow Project area. The formation was deposited in an open-marine offshore environment during the maximum westward transgression of the Cretaceous Western Interior Seaway in the Late Cretaceous (Tilton, 2001). Near the top of the formation, more sandy horizons are interbedded with the mudstone units of the formation. These sandy units together with the sandstone at the base of the overlying Straight Cliffs Formation reflect the initial sand influx onto the marine environment of the Tropic Shale. The thickness of the Tropic Shale in the Alton Quadrangle is about 700 feet.

Straight Cliffs Formation (Cretaceous)

The Straight Cliffs Formation is approximately 1,200 feet thick in the Alton Quadrangle. The formation is comprised predominantly of calcite-cemented sandstone and mudstone, with sandstone composing about 75 percent of the total composition. The sandstones of the Straight Cliffs Formation make up the lower two-thirds of the ledges radiating out from the southern Paunsaugunt Plateau. Four members of the Straight Cliffs Formation have been identified in the Alton Quadrangle by Tilton (2001). These include the Tibbet Canyon Member (orange-gray weathering fine- to medium grained sandstone), the Smoky Hollow Member (interbedded sandstone, mudstone, and thin coal), the John Henry Member (interbedded mudstone and fluvial sandstone), and Drip Tank Member (light-gray cliff forming sandstone). The Straight Cliffs Formation outcrops on the hillsides east and north of the Coal Hollow Project area.

Wahweap and Kaiparowits Formations (Cretaceous)

The Wahweap Formation is composed of alternating sandy shales and thin- to thick-bedded sandstones. The unit contains carbonaceous shale and thin coal beds that are not of economic importance in its lower part. The unit forms step-like topography. Regionally, the Wahweap Formation is separated from the overlying Kaiparowits Formation by an unconformity. Erosion of both the Wahweap and Straight Cliffs Formations prior to the deposition of the Kaiparowits Formation may have locally reduced the thicknesses of these formations in the vicinity of the Paunsaugunt Plateau. The Kaiparowits Formation is composed of irregular beds of arkosic sandstone. The sandstone is weakly cemented by calcite cement. Because of difficulties identifying mappable boundaries between the Wahweap and Kaiparowits Formations in the Alton Quadrangle, the formations were mapped as an undivided unit (Tilton, 2001). The total thickness of the Wahweap and Kaiparowits Formations in the Alton Quadrangle ranges from about 600 to 800 feet.

Claron Formation (Tertiary)

The Claron Formation (also sometimes known as the Wasatch Formation, although the Utah Geological Survey uses the name Claron Formation) forms the cap rock over much of the Paunsaugunt Plateau. The formation is also present west of the Sevier Fault Zone west and north of the town of Alton. The unit is subdivided into a lower pink (also known as red) member and an upper white member, both consisting mostly of massive, fine-grained crystalline limestone of fluvial and lacustrine origin. Resistance to erosion varies both vertically and horizontally in the Claron Formation, resulting in a series of cliffs and steep joints. This condition, together with the presence of closely spaced joints, produces the unique topography associated with the Claron Formation. The Claron Formation is about 800 thick in the Alton Quadrangle. Also mapped together with the Claron Formation in the Alton Quadrangle is the Cretaceous Canaan Peak Formation. The Canaan Peak is a thin, discontinuous formation consisting primarily of conglomerate and conglomeratic sandstone with some mudstone interbeds sometimes present at the base of the Claron Formation. Thickness of the Canaan Peak Formation locally ranges from 0 to 30 feet.

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The Brian Head Formation consists of interbedded pink and purplish-gray very fine-grained sandstone, friable sandstone, conglomerate, siltstone, mudstone, and limey mudstone in its lower part, and gray to white, fine- to medium-grained sandstone and calcarenite, in part with a volcanically derived clay matrix. The formation includes rocks present above the underlying white member of the Claron Formation and the overlying ash-flow tuff of the Needles Range Group. The unit is not resistant to erosion and has been eroded away from the top of the Paunsaugunt Plateau in the Alton Quadrangle. The formation is present in the rugged hills west of the Sevier Fault zone near the town of Alton. The unit is about 200 feet thick in the Alton Quadrangle.

Quaternary Deposits

Quaternary deposits present in the area include pediment alluvium, landslide deposits, mass-wasting debris, and alluvium.

The pediment alluvium deposits in the region consist of poorly sorted alluvial and colluvial silt, sand, and gravel deposited on broad pediments. After deposition, the pediment surfaces were abandoned as streams have cut down to lower levels.

Landslide deposits in the area are primarily gravity-transported hummocky deposits of mud, sand, and occasional blocks of sandstone. Most of the landslide deposits originated from the lower portion of the Straight Cliffs Formation and slid onto the underlying Tropic Shale, although movement within the Tropic Shale has also occurred. A conspicuous series of progressively built landslide deposits is present east of the Alton Amphitheater as a broad, rolling apron below the lowest cliffs of the Straight Cliffs Formation. The thickness of the landslide deposits locally ranges from a few feet to more than 100 feet.

Alluvium deposits in the region consist of unconsolidated clay, silt, sand, and gravel in and near existing drainages. These deposits exist as stream and fan alluvium and terrace deposits. In the headwaters of the mountain streams, the alluvial material consists predominantly of sand and gravel. In downstream areas, the alluvial material consists mostly of mud derived from the Tropic Shale. Alluvial thickness in the Alton Quadrangle typically ranges from a thin covering to about 10 feet or more.

Additionally, an igneous dike consisting of black, fine-grained porphyritic olivine basalt is present northeast of Alton near Kanab Creek.

Structure

Rock strata in the region dip gently toward the north and north-east, generally from 1 to 5 degrees. The Alton Coal Field is bounded on the east by the Paunsaugunt Fault, on the west by the Sevier Fault. Regional displacements on these two faults are about 1,000 to 2,000 feet, and 100 to 800 feet, respectively. Additionally, several faults with lesser displacements have been mapped in the

region, including the Sand Pass Fault zone (about 400 feet of offset), the Bald Knoll Fault (about 650 feet of offset), and the Sink Valley Fault. Most local faults in the Alton Quadrangle trend in a northerly or north-westerly direction, are several miles long, and are near vertical. A prominent north- to northwest-trending vertical joint set is present in the Upper Cretaceous sandstone rocks in the region. Stratal dips vary appreciably near the fault zones.

The Sink Valley Fault is of particular importance in the Coal Hollow Project area. The fault extends in a roughly north-south direction from upland areas between the Robinson Creek and Kanab Creek drainages southward along the western margins of Sink Valley (Drawing 6-1). The fault dissects the proposed Coal Hollow permit area. It is noteworthy that the region east of the Sink Valley Fault is appreciably wetter than the region west of the fault. In contrast to the region east of the fault, no springs have been identified in the relatively dry region west of the Sink Valley Fault. The fault is reported to have appreciably down-dropped the geologic strata west of the fault relative to the strata east of the fault (Tilton, 2001; Drawing 6-2). The offset on the Sink Valley Fault has not been determined, although Tilton (2001) infers that the offset is likely on the order of several tens to hundreds of feet (Drawing 6-2). The influence of the Sink Valley Fault on the operation of the hydrogeologic regime east of proposed mining areas will be a subject of further investigation. Additional hydrogeologic and geologic investigations and characterizations of the Sink Valley Fault are planned for the 2006 field season. The findings of these investigations will be submitted to the Division upon their completion.

Description of Coal Seam Geology

The coal seams in the Alton Coal Field are located in the Smoky Hollow Member of the Straight Cliffs Formation, and in the Dakota Formation. The coal seam in the Smoky Hollow Member, which occurs within the lower 3 feet of the Member, is only a few inches in thickness and is not of economic importance. Within the Dakota Formation, two regionally important coal zones are present. These include the Smirl coal zone, which is located near the upper formational contact with the Tropic Shale, and the Bald Knoll coal zone, which is located about 200 feet below the Smirl coal zone near the base of the Dakota Formation. Some previous researchers have included the Smirl coal zone as part of the overlying Tropic Shale.

The coal in the Alton Coal Field is reported to have an apparent rank of sub-bituminous B, with an average heating value of about 9,560 Btu, an average sulfur content of 1.0 percent, and an average ash content of 7.2 percent (Tilton, 2001). Doelling (1972) reports that coal in the Alton area is a high-volatile C Bituminous coal. Doelling also reports that a coal sample from the Smirl Mine contained 0.56 percent sulfur: 0.01 percent sulfate, 0.11 percent pyritic sulfur, and 0.44 percent organic sulfur. The sample also contained 18.5 percent moisture and 6.3 percent ash. Doelling (1972) reported that the Smirl coal zone is 14 to 18 feet thick without splits, while the Bald Knoll coal zone contains several coal seams separated by thin splits, with the thickest seam being 4.8 feet thick.

Groundwater

The depositional history of geologic formations in the proposed permit and adjacent area has resulted in a heterogeneous sequence of rocks that have a profound effect on the movement and availability of groundwater. The stratigraphic package located in the upland regions along the Paunsaugunt Plateau lies well beyond the zone that could potentially be impacted by mining operations in the Coal Hollow Project area. With the exception of the Navajo Sandstone, the rock formations present along the flanks of the Paunsaugunt Plateau area are typically lenticular in nature. Although aquifer-quality rocks may be present in lenses within individual geologic formations, the fact that the lenses are discontinuous in their extent and are typically encased in a surrounding low-permeability matrix, regional type groundwater flow regimes typically do not exist. Additionally, because the geologic formations in the Paunsaugunt Plateau overlying the Tropic Shale are truncated by the plateau escarpment, long, regional type groundwater flow paths typically cannot exist. In the immediate vicinity of the proposed Coal Hollow Project permit and adjacent areas, only the Tropic Shale and underlying Dakota Sandstone are present at the surface or in the shallow subsurface. The water-bearing and water-transmitting properties of the Tropic Shale are poor. Lithologic data collected during drilling in the Tropic Shale indicates that the rocks of the Tropic Shale in the proposed mining area are composed almost entirely of uniform shale or silty shale with high clay content. No appreciable water was encountered during drilling activities in the Tropic Shale in the proposed mining areas and no spring discharge from the formation has been observed. The Tropic Shale in the proposed permit area is underlain by the Dakota Formation, which crops out in the extreme western portion of the proposed permit area and also along the western portion of the study area in the Kanab Creek drainage (Drawing 6-1). Recharge to the Dakota Formation through the overlying Tropic Shale is likely negligible due to the poor groundwater transmitting properties of the Tropic Shale discussed above. Consequently, groundwater discharge from the rocks of the Dakota Formation in the proposed permit area is not appreciable. Because vertical recharge to the Dakota Formation from the Tropic Shale is likely minimal, the removal of the Tropic Shale from above the Dakota Formation during mining operations would likely not detrimentally impact groundwater recharge mechanisms of the Dakota Formation.

It should be noted that Tilton (2001) infers the presence of the Dakota Formation in the shallow subsurface immediately east of the Sink Valley Fault in the eastern portion of the Coal Hollow Project area (Drawing 6-2). This area is a zone of considerable wetness with numerous springs and seeps and flowing artesian wells. The possible relationship between the presence of the Dakota Formation in the shallow subsurface juxtaposed to relatively impermeable Tropic Shale and the occurrence of considerable local groundwater discharge will be the subject of future hydrogeologic investigations. It should be noted that a conservation area has been created in the wet hydrologic regime east of the Sink Valley Fault in which mining will not occur.

Shallow groundwater systems have been identified in alluvial sediments in the region, most notably in the vicinity of Sink Valley. These systems appear to exist principally as perched groundwater in the fine-grained alluvial material atop the underlying Tropic Shale bedrock. Because of the very poor water transmitting properties of the Tropic Shale, shallow, alluvial groundwater that is perched on the Tropic Shale has the potential to migrate for considerable distances down-gradient without infiltrating into the underlying bedrock substrate. Additionally, direct infiltration of precipitation

and snowmelt water through the more permeable soil horizons into the shallow perched groundwater systems may be appreciable.

624.110 Cross Sections, Maps, Plans.

624.120 Information for this section is found in R645-301-624.200, R645-301-624.300 and R645-301-625.

624.130 Geologic Literature and Practices

The geologic literature utilized in preparing R645-301-600 is listed in the reference list presented at the end of this chapter.

Additional geologic data were collected during field investigations conducted by qualified personnel. Geologic analysis and geologic interpretations were performed by a registered professional geologist in the State of Utah. All practices and procedures for obtaining geologic information have been standard for the industry

624.200
Samples have been collected and analyzed from test borings in the proposed permit area. The samples were collected from fresh, unweathered, uncontaminated drill cores. The samples were collected and analyzed from the ground surface down to and including the first stratum immediately below the Smirl coal zone to be mined. The laboratory analytical parameters analyzed were comprehensive and as recommended by the Division. Results of the analyses are presented in Appendix 6-2.

624.210
Geologic logs were prepared that show the lithologic characteristics including physical properties and thickness of each stratum and locations of ground water where occurring. The well logs are presented in Appendix 6-1.

624.220
Chemical analyses of strata overlying and immediately below the Smirl coal zone for acid- or toxic-forming materials including total sulfur and pyretic sulfur are presented in Appendix 6-2.

624.230
Chemical analyses of the Smirl coal seam for acid- or toxic-forming materials including total sulfur and pyritic sulfur are presented in Appendix 6-2.

624.300
The proposed mining in the Coal Hollow Project area does not include underground coal mining activities. This section is not applicable.

627 OVERBURDEN THICKNESS AND LITHOLOGY

The proposed mining in the Coal Hollow Project area does not include underground coal mining activities. This section is not applicable.

630 OPERATION PLAN

631 PLAN FOR CASING AND SEALING EXPLORATION HOLES

Exploration drill holes will be sealed with cement or, where appropriate, with native, low-permeability materials. All drill holes will meet the specifications set forth by the State Engineer and the Division of Water Rights as required. A licensed driller will perform the work of sealing the drill holes. Monitoring or water wells will meet the provisions of R645-301-731. Exploration holes will be permanently closed, unless approved for water monitoring or otherwise managed in a manner approved by the Division.

631.100
Those holes which remain open for use as water supply wells or for groundwater monitoring wells will be completed with well casings that protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. Additionally, the wells will be fitted with well caps to prevent the introduction of foreign objects into the well. The wells will be protected by barricades, fences, or other protective devices approved by the Division. These protective devices will be periodically inspected and maintained in good operating condition. When the well is no longer needed, the well will be sealed in accordance with the procedures described in R645-301-631.

631.200
When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health or safety effect, or unless approved for transfer as a water will under R645-301-731.400, each exploration hole or borehole will be plugged, capped, sealed, backfilled or otherwise properly managed under R645-301-631 and consistent with 30 CFR 75.1711. Permanent closure methods will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, and machinery and to keep acid or other toxic drainage from entering water resources.

632 SUBSIDENCE MONITORING

The proposed mining in the Coal Hollow Project area does not include underground coal mining activities. This section is not applicable.

640 PERFORMANCE STANDARDS

641 ALL EXPLORATION HOLES AND BOREHOLES

All exploration holes and boreholes will be permanently cased and sealed according to the requirements of R645-301-631 and R645-301-631.200.

642 MONUMENTS AND SURFACE MARKERS

All monuments and surface markers used as subsidence monitoring points and identified under R645-301-632.200 will be reclaimed in accordance with R645-301-521.210.

REFERENCES

Doelling, H.H., 1972, Alton Coal Field, *in* Utah Geological and Mineralogical Survey, Southwestern Utah coal fields: Alton, Kaiparowits Plateau and Kolob-Harmony, Monograph Series No. 1, 333 p.

Ferguson, R.B. and N.C. Frischknecht. 1985. Reclamation on Utah's Emery and Alton Coal Fields: Techniques and Plant Materials. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. 78 pp.

Tilton, T.L., 2001, Geologic map of the Alton Quadrangle, Kane County, Utah, Utah Geological Survey, Miscellaneous Publication 01-4, 7.5 minute geologic map, cross-sections, and text.

USDI. 1975. Resource and Potential Reclamation Evaluation, Alton Study Site, Alton Coal Field. U.S. Department of Interior, Bureau of Land Management. Salt Lake City, UT. 130 pp.

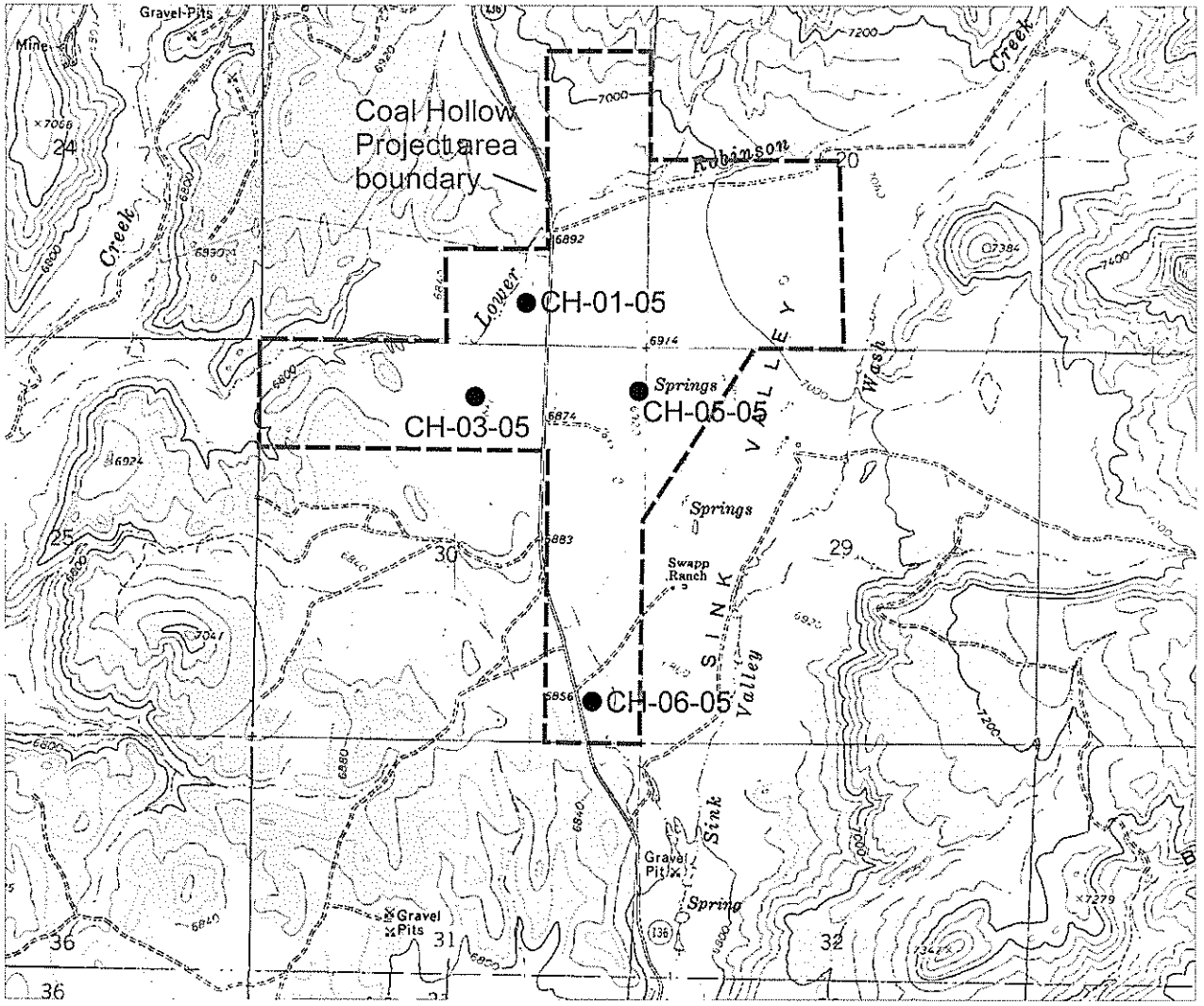
APPENDIX 6-1

Coal Hollow Project

Exploration drill hole locations
and geologic logs

112° 28' 45.517" W
37° 24' 36.220" N

112° 25' 29.180" W
37° 24' 38.632" N



37° 22' 25.703" N
112° 28' 42.952" W

37° 22' 28.112" N
112° 25' 26.710" W

0 ¼ ½ 1 Mile

0 1000 2000 3000 5000 Feet

0 0.5 1 Kilometer

1927 North American Datum; UTM grid zone 12
Generated by BigTopo7 (www.igage.com)
Map compiled from USGS Quads: Alton; UT
Bald Knoll; UT

UTM Grid and 2006 Magnetic North
Declination at Center of Sheet
GN to TN 0.882° (16 mils)
TN to MN 12.973° (231 mils)

Location map for Coal Hollow Project drill holes.

CH-01-05

Project: Alton Coal Development, LLC
Borehole: CH-01-05
Location (UTM, NAD 27) Northing: 4139959
Easting: 371167
Date Drilled: 9-10 November 2005
Geologist: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-180 feet)

0-8 Soil

8-40 Clay, gray (auger drilled)

40-55 Silty clay, gray, dense, and 0.5' bentonite layer, white to orange

55-56 Silty shale, gray
56-58 Carbonaceous shale, dark gray
58-59.2 Low-grade coal and organic shale, dark gray to black, some fossiliferous intervals

59.2-73 Coal, black with some brown mottled zones

73-75.8 Siltstone, gray, clayey
75.8-76.0 Shale, gray; 76.0-76.3 Siltstone, gray, clayey, laminated; 76.3-76.6 Shale, gray
76.6-80 Organic siltstone/shale, highly laminated, dark gray

0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200

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Utah PG #5373615-2250

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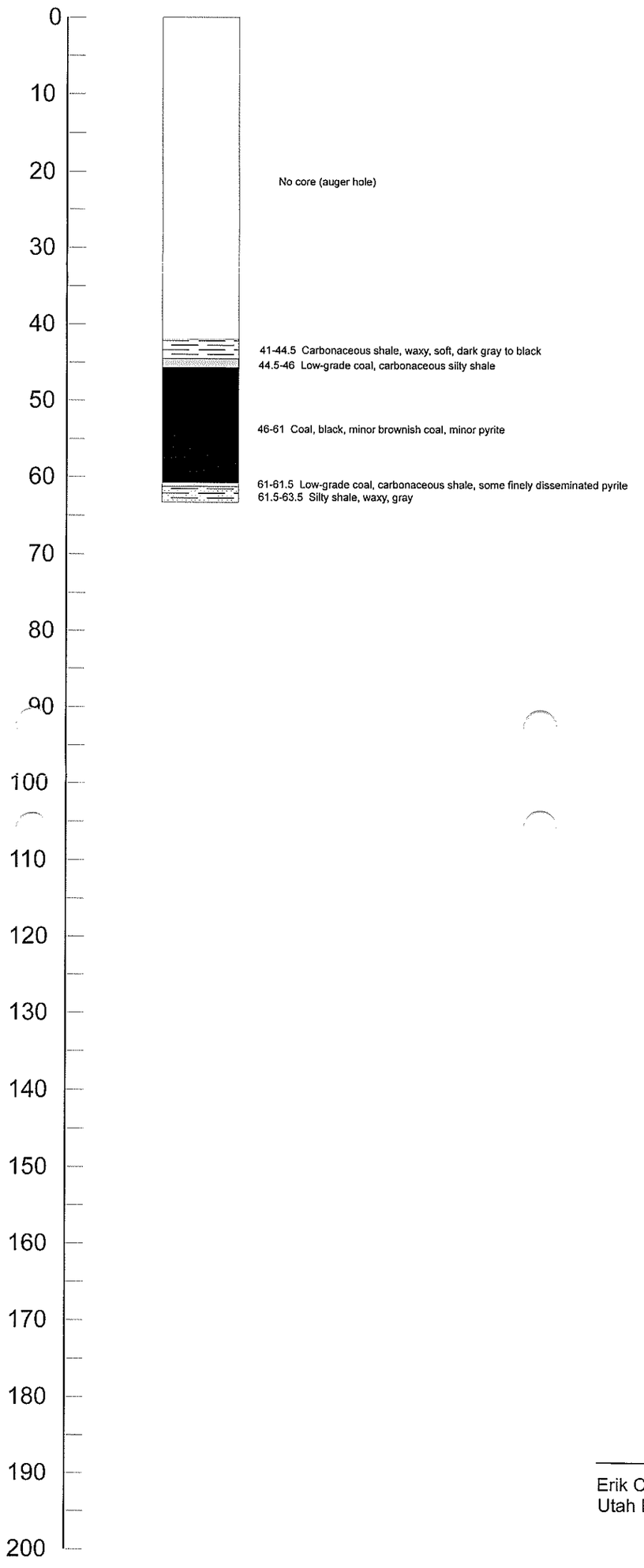
CH-03-05

Project: Alton Coal Development, LLC
Borehole: CH-West-05
Location (UTM, NAD 27) Northing:
Easting:
Date Drilled: 12 November 2005
Core logged by: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-41 feet)
Continuous HQ core (41-63.5 feet)



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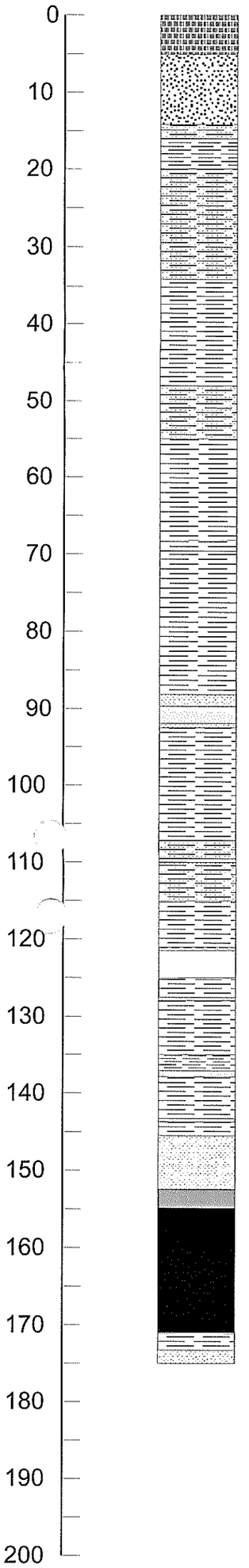
CH-05-05



0-5 Soil, Clayey

5-14 Gravel with sand and silt, reddish

14-16.5 Clayey silt, wet

16.5-20 Clay, moist, tight

20-34 Silty clay, dark gray, less dense than above

34-48 Clay, stiff, medium gray

48-55 Dark gray silty carbonaceous shale, soft waxy texture, some minor interbedded shaley siltstone, iron-stained fracture zone at 50-51 feet

55-68 Carbonaceous shale with minor silt, dark gray to black, more competent that above

68-69.5 Fractured/broken carbonaceous shale, dark gray to black

69.5-88.5 Carbonaceous shale, dark gray to black, soft, waxy texture

88.5-89.5 Medium gray siltstone
89.5-92 Bentonite, medium to dark gray, pure
92-92.5 Siltstone, medium gray

92.5-107 Carbonaceous shale, dark gray to black, soft, waxy texture

107-109.5 Siltstone and carbonaceous shale, interbedded, thinly laminated, dark gray
109.5-110 Carbonaceous shale, dark gray to black, soft, waxy texture

110-115 Siltstone and carbonaceous shale, interbedded, thinly laminated, dark gray

115-121.5 Carbonaceous shale, dark gray to black, soft, wax[illegible]e, (poor core recovery)

121.5-122 Limey claystone, dark gray, fossiliferous, (small, open fracture in this interval)

122-125 Little or no recovery in this zone

125-127.5 Carbonaceous shale, dark gray to black, soft, waxy texture
127.5-128 Bentonite, medium to light gray

128-135 Carbonaceous shale, dark gray to black, soft, waxy texture

135-137 Carbonaceous shale, dark gray to black, harder than above
137-138 Bentonite, medium to light gray

138-143.5 Carbonaceous shale, dark gray to black, soft, waxy texture

143.5-144 Bentonite and interbedded carbonaceous shale, dark and medium gray, thinly laminated
144-146 Carbonaceous shale and thin interbeds of siltstone, dark gray to black

146-152.3 Siltstone with minor thin interbeds of carbonaceous shale, mottled gray to black

152.3-154.7 Coal, low grade or highly carbonaceous shale, black, abundant white fossils/fossil hash

154.7-171.5 Coal, black, some brown mottled zones

171.5-171.7 Coal, low grade, brown and black
171.7-173.5 Carbonaceous shale, dark gray to black
173.5-175 Siltstone, gray, interbedded with minor carbonaceous shale

Project: Alton Coal Development, LLC
Borehole: CH-05-05
Location (UTM, NAD 27) Northing: 4139608
Easting: 371651
Date Drilled: 8 November 2005
Geologist: Erik Petersen, P. G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-175 feet)

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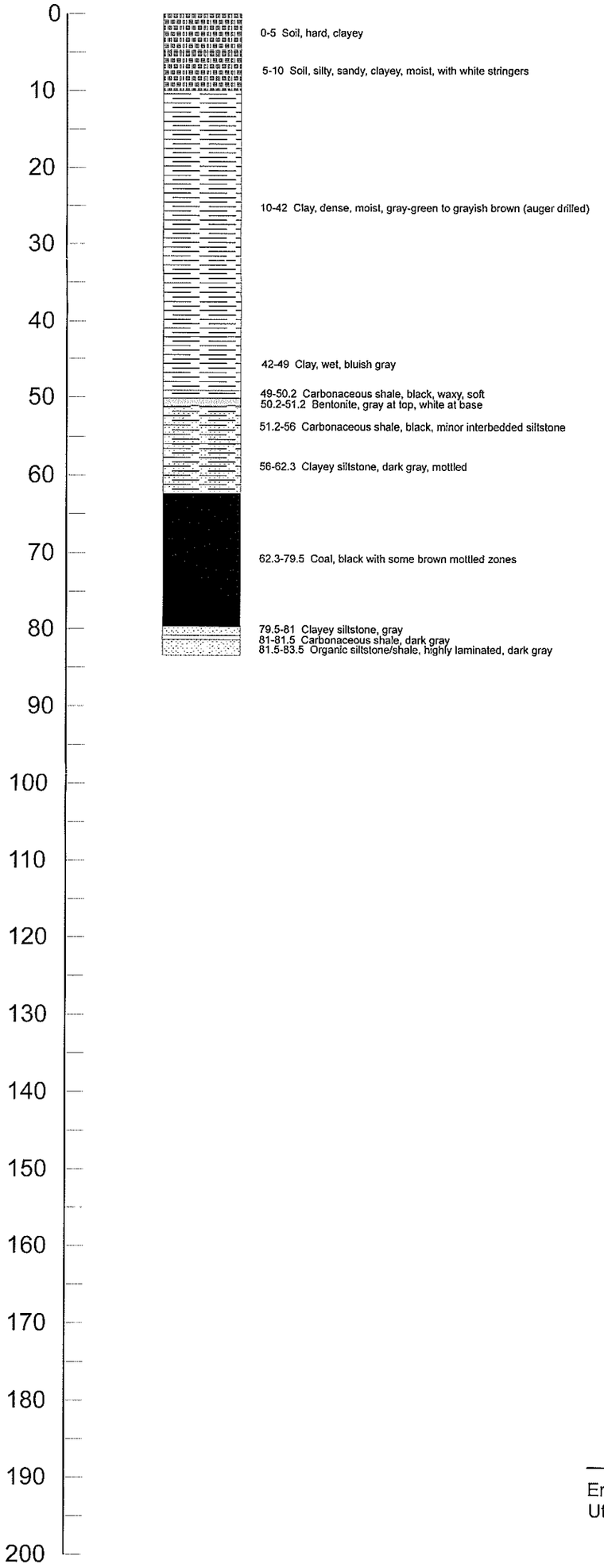
CH-06-05

Project: Alton Coal Development, LLC
Borehole: CH-06-05
Location (UTM, NAD 27) Northing: 4138401
Easting: 371434
Date Drilled: 11 November 2005
Geologist: Erik Petersen, P.G.
Drilling Company: DA Smith Drillers
Grand Junction, CO

Drilling Method: Auger (0-40 feet)
Continuous NQ core (40-83.5 feet)



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APPENDIX 6-2

Coal Hollow Project

Overburden, coal, and underburden chemical analyses

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Toll Free 800.735.4489 * 406.252.6325 * FAX 406.252.6069 * eli@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-001
Client Sample ID: Box 1 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	12	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	53	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	35	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	3	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.60	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	3.50	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	99.1	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	1.01	meq/L		0.05		SW6010B	03/15/06 18:15 / rlh
Magnesium, sat. paste	0.58	meq/L		0.08		SW6010B	03/15/06 18:15 / rlh
Potassium, sat. paste	0.32	meq/L		0.03		SW6010B	03/15/06 18:15 / rlh
Sodium, sat. paste	32.9	meq/L	D	0.07		SW6010B	03/15/06 18:15 / rlh
Sodium Adsorption Ratio (SAR)	36.9	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	220	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	12	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	210	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	22.0	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	1.32	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 13:59 / srm
METALS, WATER EXTRACTABLE							
Boron	0.8	mg/kg		0.1		SW6010B	03/17/06 03:20 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Barium	53	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:23 / rlh
Chromium	8	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Copper	16	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Iron	9820	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Lead	8	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Manganese	195	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:22 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:23 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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Toll Free 800.735.4489 * 406.252.6325 * FAX 406.252.6069 * eli@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-001
Client Sample ID: Box 1 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:23 / rlh
Zinc	41	mg/kg		5		SW6010B	03/13/06 22:23 / rlh

Report Definitions:
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QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-002
Client Sample ID: Box 2 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	14	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	56	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	30	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	11	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.80	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	2.58	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	101	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.37	meq/L		0.05		SW6010B	03/15/06 18:20 / rlh
Magnesium, sat. paste	0.11	meq/L		0.08		SW6010B	03/15/06 18:20 / rlh
Potassium, sat. paste	0.18	meq/L		0.03		SW6010B	03/15/06 18:20 / rlh
Sodium, sat. paste	23.6	meq/L	D	0.07		SW6010B	03/15/06 18:20 / rlh
Sodium Adsorption Ratio (SAR)	48.1	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	210	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	13	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	200	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	21.2	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	1.10	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	1	mg/kg		1		ASA33-8.1	03/15/06 14:00 / srm
METALS, WATER EXTRACTABLE							
Boron	1.0	mg/kg		0.1		SW6010B	03/17/06 03:29 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Barium	52	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:34 / rlh
Chromium	6	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Copper	12	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Iron	9000	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Lead	9	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Manganese	143	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:28 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:34 / rlh

Report Definitions:
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QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-002
Client Sample ID: Box 2 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:34 / rlh
Zinc	38	mg/kg		5		SW6010B	03/13/06 22:34 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-003
Client Sample ID: Box 3 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	6	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	61	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	33	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	6	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.30	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.74	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	144	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.21	meq/L		0.05		SW6010B	03/15/06 18:24 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 18:24 / rlh
Potassium, sat. paste	0.10	meq/L		0.03		SW6010B	03/15/06 18:24 / rlh
Sodium, sat. paste	15.9	meq/L		0.04		SW6010B	03/15/06 18:24 / rlh
Sodium Adsorption Ratio (SAR)	43.1	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	89	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	13	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	76	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	8.9	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	1.18	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	1	mg/kg		1		ASA33-8.1	03/15/06 14:01 / srm
METALS, WATER EXTRACTABLE							
Boron	1.4	mg/kg		0.1		SW6010B	03/17/06 03:38 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Barium	53	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:42 / rlh
Chromium	ND	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Copper	9	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Iron	8040	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Lead	9	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Manganese	83	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:30 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:42 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-003
Client Sample ID: Box 3 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:42 / rlh
Zinc	42	mg/kg		5		SW6010B	03/13/06 22:42 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-004
Client Sample ID: Box 4 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	8	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	53	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	39	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	6	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.50	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	0.91	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	162	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.10	meq/L		0.05		SW6010B	03/15/06 19:05 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 19:05 / rlh
Potassium, sat. paste	0.05	meq/L		0.03		SW6010B	03/15/06 19:05 / rlh
Sodium, sat. paste	8.20	meq/L		0.04		SW6010B	03/15/06 19:05 / rlh
Sodium Adsorption Ratio (SAR)	33.4	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	100	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	10	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	95	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	10.5	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.96	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	1	mg/kg		1		ASA33-8.1	03/15/06 14:01 / srm
METALS, WATER EXTRACTABLE							
Boron	1.4	mg/kg		0.1		SW6010B	03/17/06 04:15 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Barium	46	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:45 / rlh
Chromium	ND	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Copper	7	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Iron	6480	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Lead	10	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Manganese	74	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:33 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:45 / rlh

Report Definitions:
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QCL - Quality control limit.
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ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-004
Client Sample ID: Box 4 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:45 / rlh
Zinc	32	mg/kg		5		SW6010B	03/13/06 22:45 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-005
Client Sample ID: Box 5 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	18	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	47	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	35	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	8	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.30	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.28	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	144	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.18	meq/L		0.05		SW6010B	03/15/06 19:09 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 19:09 / rlh
Potassium, sat. paste	0.08	meq/L		0.03		SW6010B	03/15/06 19:09 / rlh
Sodium, sat. paste	11.6	meq/L		0.04		SW6010B	03/15/06 19:09 / rlh
Sodium Adsorption Ratio (SAR)	35.8	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	160	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	9.0	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	140	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	15.5	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.86	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	1	mg/kg		1		ASA33-8.1	03/15/06 14:02 / srm
METALS, WATER EXTRACTABLE							
Boron	1.4	mg/kg		0.1		SW6010B	03/17/06 04:20 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Barium	55	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:49 / rlh
Chromium	ND	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Copper	7	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Iron	5730	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Lead	12	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Manganese	825	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:35 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:49 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-005
Client Sample ID: Box 5 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:49 / rlh
Zinc	41	mg/kg		5		SW6010B	03/13/06 22:49 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-006
Client Sample ID: Box 6 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	8	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	63	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	29	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	8	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.80	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	2.87	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	85.0	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.42	meq/L		0.05		SW6010B	03/15/06 19:13 / rlh
Magnesium, sat. paste	0.19	meq/L		0.08		SW6010B	03/15/06 19:13 / rlh
Potassium, sat. paste	0.24	meq/L		0.03		SW6010B	03/15/06 19:13 / rlh
Sodium, sat. paste	26.8	meq/L	D	0.07		SW6010B	03/15/06 19:13 / rlh
Sodium Adsorption Ratio (SAR)	48.6	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	100	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	11	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	91	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	10.2	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	1.28	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:06 / srm
METALS, WATER EXTRACTABLE							
Boron	1.3	mg/kg		0.1		SW6010B	03/17/06 04:24 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Barium	76	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 22:52 / rlh
Chromium	11	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Copper	14	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Iron	7990	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Lead	7	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Manganese	64	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:41 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 22:52 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-006
Client Sample ID: Box 6 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 22:52 / rlh
Zinc	43	mg/kg		5		SW6010B	03/13/06 22:52 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-007
Client Sample ID: Box 7 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	18	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	57	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	25	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	16	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.60	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	3.39	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	72.9	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.65	meq/L	D	0.07		SW6010B	03/15/06 19:22 / rlh
Magnesium, sat. paste	0.34	meq/L		0.08		SW6010B	03/15/06 19:22 / rlh
Potassium, sat. paste	0.29	meq/L		0.03		SW6010B	03/15/06 19:22 / rlh
Sodium, sat. paste	31.8	meq/L	D	0.07		SW6010B	03/15/06 19:22 / rlh
Sodium Adsorption Ratio (SAR)	45.3	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	130	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	11	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	120	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	13.4	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.89	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:06 / srm
METALS, WATER EXTRACTABLE							
Boron	1.1	mg/kg		0.1		SW6010B	03/17/06 04:29 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Barium	61	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:04 / rlh
Chromium	8	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Copper	10	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Iron	9060	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Lead	6	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Manganese	319	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:44 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:04 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-007
Client Sample ID: Box 7 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:04 / rlh
Zinc	33	mg/kg		5		SW6010B	03/13/06 23:04 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-008
Client Sample ID: Box 8 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	12	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	59	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	29	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	12	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.30	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.81	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	142	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.15	meq/L		0.05		SW6010B	03/15/06 19:26 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 19:26 / rlh
Potassium, sat. paste	0.11	meq/L		0.03		SW6010B	03/15/06 19:26 / rlh
Sodium, sat. paste	16.5	meq/L		0.04		SW6010B	03/15/06 19:26 / rlh
Sodium Adsorption Ratio (SAR)	52.4	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	60	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	23	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	37	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	6.0	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.96	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:20 / srm
METALS, WATER EXTRACTABLE							
Boron	2.2	mg/kg		0.1		SW6010B	03/17/06 04:33 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Barium	106	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:08 / rlh
Chromium	15	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Copper	17	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Iron	11800	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Lead	8	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Manganese	94	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:46 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:08 / rlh

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MCL - Maximum contaminant level. ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-008
Client Sample ID: Box 8 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:08 / rlh
Zinc	38	mg/kg		5		SW6010B	03/13/06 23:08 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-009
Client Sample ID: Box 9 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	12	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	53	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	35	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	10	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.30	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.30	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	163	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.11	meq/L		0.05		SW6010B	03/15/06 19:31 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 19:31 / rlh
Potassium, sat. paste	0.09	meq/L		0.03		SW6010B	03/15/06 19:31 / rlh
Sodium, sat. paste	12.3	meq/L		0.04		SW6010B	03/15/06 19:31 / rlh
Sodium Adsorption Ratio (SAR)	46.9	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	34	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	21	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	13	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	3.4	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.86	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	1	mg/kg		1		ASA33-8.1	03/15/06 14:08 / srm
METALS, WATER EXTRACTABLE							
Boron	1.9	mg/kg		0.1		SW6010B	03/17/06 04:38 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Barium	118	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:11 / rlh
Chromium	11	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Copper	12	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Iron	10700	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Lead	10	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Manganese	73	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:48 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:11 / rlh

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MCL - Maximum contaminant level. ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-009
Client Sample ID: Box 9 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:11 / rlh
Zinc	41	mg/kg		5		SW6010B	03/13/06 23:11 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-010
Client Sample ID: Box 10 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	32	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	43	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	25	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	27	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	L					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.30	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	5.42	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	76.7	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	2.24	meq/L		0.05		SW6010B	03/15/06 19:35 / rlh
Magnesium, sat. paste	1.14	meq/L		0.08		SW6010B	03/15/06 19:35 / rlh
Potassium, sat. paste	0.46	meq/L		0.03		SW6010B	03/15/06 19:35 / rlh
Sodium, sat. paste	54.2	meq/L	D	0.1		SW6010B	03/15/06 19:35 / rlh
Sodium Adsorption Ratio (SAR)	41.7	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	23	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	15	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	8	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	2.3	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	2.92	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:08 / srm
METALS, WATER EXTRACTABLE							
Boron	1.5	mg/kg		0.1		SW6010B	03/17/06 04:42 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Barium	70	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:15 / rlh
Chromium	6	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Copper	7	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Iron	6720	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Lead	8	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Manganese	68	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:50 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:15 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-010
Client Sample ID: Box 10 CH-5 Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:15 / rlh
Zinc	29	mg/kg		5		SW6010B	03/13/06 23:15 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-011
Client Sample ID: Box 13 CH-5 Below

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	6	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	56	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	38	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	6	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	9.00	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.66	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	49.0	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	0.23	meq/L		0.05		SW6010B	03/15/06 19:39 / rlh
Magnesium, sat. paste	ND	meq/L		0.08		SW6010B	03/15/06 19:39 / rlh
Potassium, sat. paste	0.18	meq/L		0.03		SW6010B	03/15/06 19:39 / rlh
Sodium, sat. paste	18.1	meq/L		0.04		SW6010B	03/15/06 19:39 / rlh
Sodium Adsorption Ratio (SAR)	46.3	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	51	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	2.0	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	49	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	5.1	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.75	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:09 / srm
METALS, WATER EXTRACTABLE							
Boron	1.8	mg/kg		0.1		SW6010B	03/17/06 04:47 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Barium	21	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:19 / rlh
Chromium	18	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Copper	24	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Iron	5700	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Lead	19	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Manganese	59	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:52 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:19 / rlh

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MCL - Maximum contaminant level. ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-011
Client Sample ID: Box 13 CH-5 Below

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:19 / rlh
Zinc	75	mg/kg		5		SW6010B	03/13/06 23:19 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-012
Client Sample ID: CH 3 Below Underburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	8	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	45	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	47	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	5	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiC					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	8.20	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	1.88	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	60.0	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	1.80	meq/L		0.05		SW6010B	03/15/06 19:44 / rlh
Magnesium, sat. paste	1.20	meq/L		0.08		SW6010B	03/15/06 19:44 / rlh
Potassium, sat. paste	0.46	meq/L		0.03		SW6010B	03/15/06 19:44 / rlh
Sodium, sat. paste	15.3	meq/L		0.04		SW6010B	03/15/06 19:44 / rlh
Sodium Adsorption Ratio (SAR)	12.5	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	78	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	2.0	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	75	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	7.8	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.78	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:10 / srm
METALS, WATER EXTRACTABLE							
Boron	3.0	mg/kg		0.1		SW6010B	03/17/06 04:56 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	ND	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Barium	21	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:22 / rlh
Chromium	19	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Copper	27	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Iron	6820	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Lead	20	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Manganese	89	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:54 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:22 / rlh

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MCL - Maximum contaminant level. ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. * 1120 S 27th St * PO Box 30916 * Billings, MT 59107-0916
Toll Free 800.735.4489 * 406.252.6325 * FAX 406.252.6069 * eli@energylab.com

LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-012
Client Sample ID: CH 3 Below Underburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:22 / rlh
Zinc	122	mg/kg		5		SW6010B	03/13/06 23:22 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-013
Client Sample ID: CH 3 Above Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Sand	8	%		1		ASA15-5	03/16/06 08:32 / srm
Silt	59	%		1		ASA15-5	03/16/06 08:32 / srm
Clay	33	%		1		ASA15-5	03/16/06 08:32 / srm
Very Fine Sand	8	wt%				ASA15-5	03/30/06 09:23 / srm
Texture	SiCL					ASA15-5	03/16/06 08:32 / srm
- C = Clay, S = Sand(y), Si = Silt(y), L = Loam(y)							
SATURATED PASTE							
pH, sat. paste	7.80	s.u.		0.10		ASAM10-3.2	03/15/06 11:13 / srm
Conductivity, sat. paste	3.25	mmhos/cm		0.01		ASA10-3	03/15/06 11:13 / srm
Saturation	88.5	%		0.1		USDA27a	03/15/06 11:13 / srm
Calcium, sat. paste	9.16	meq/L	D	0.07		SW6010B	03/15/06 20:00 / rlh
Magnesium, sat. paste	10.3	meq/L		0.08		SW6010B	03/15/06 20:00 / rlh
Potassium, sat. paste	0.86	meq/L		0.03		SW6010B	03/15/06 20:00 / rlh
Sodium, sat. paste	16.0	meq/L	D	0.07		SW6010B	03/15/06 20:00 / rlh
Sodium Adsorption Ratio (SAR)	5.14	unitless		0.01		Calculation	03/16/06 10:44 / srm
ACID-BASE ACCOUNTING							
Neutralization Potential	100	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid Potential	10	t/kt		1.0		Sobek Modified	03/16/06 16:04 / srm
Acid/Base Potential	90	t/kt				Sobek Modified	03/16/06 16:04 / srm
- The acid base potential was calculated from non-sulfate sulfur.							
CHEMICAL CHARACTERISTICS							
Lime as CaCO3	10	%		0.1		USDA23c	03/16/06 10:05 / srm
Organic Carbon	0.95	wt%		0.02		ASA29-3	03/14/06 14:52 / srm
Nitrate as N, KCL Extract	ND	mg/kg		1		ASA33-8.1	03/15/06 14:11 / srm
METALS, WATER EXTRACTABLE							
Boron	1.6	mg/kg		0.1		SW6010B	03/17/06 05:13 / rlh
METALS, TOTAL - EPA SW846							
Arsenic	12	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Barium	41	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Cadmium	ND	mg/kg		1		SW6010B	03/13/06 23:26 / rlh
Chromium	6	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Copper	10	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Iron	11600	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Lead	8	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Manganese	124	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Mercury	ND	mg/kg		1		SW7471A	03/15/06 17:56 / jkc
Molybdenum	ND	mg/kg		5		SW6010B	03/13/06 23:26 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: Patrick Collins
Project: Coal Hollow
Lab ID: B06030458-013
Client Sample ID: CH 3 Above Overburden

Report Date: 03/30/06
Collection Date: Not Provided
Date Received: 03/07/06
Matrix: Soil

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL - EPA SW846							
Selenium	ND	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Silver	ND	mg/kg		5		SW6010B	03/13/06 23:26 / rlh
Zinc	41	mg/kg		5		SW6010B	03/13/06 23:26 / rlh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.